AMERICAN GAS JOURNAL

DECEMBER, 1936

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PERIODICAL DIVISION

Merry *To Every Gasman* Christmas!

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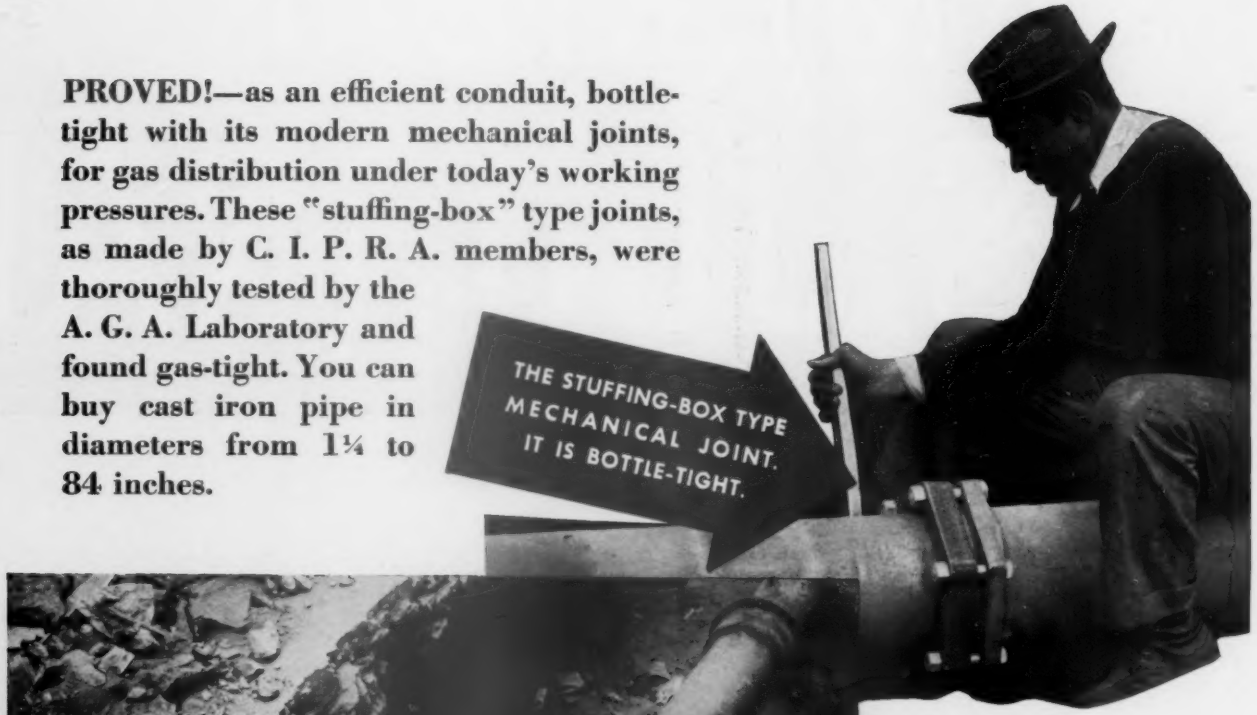
BRIDGEPORT, CONN.

PROVED!—as an efficient conduit, bottle-tight with its modern mechanical joints, for gas distribution under today's working pressures. These "stuffing-box" type joints, as made by C. I. P. R. A. members, were thoroughly tested by the A. G. A. Laboratory and found gas-tight. You can buy cast iron pipe in diameters from 1¼ to 84 inches.



PROVED!—as an underground structure of long life and economy by century-old gas distribution mains such as this one in Boston and others in Philadelphia, Baltimore and Charleston, S. C.—all of them still functioning.

CAST IRON PIPE

FOR DISTRIBUTION MAINS

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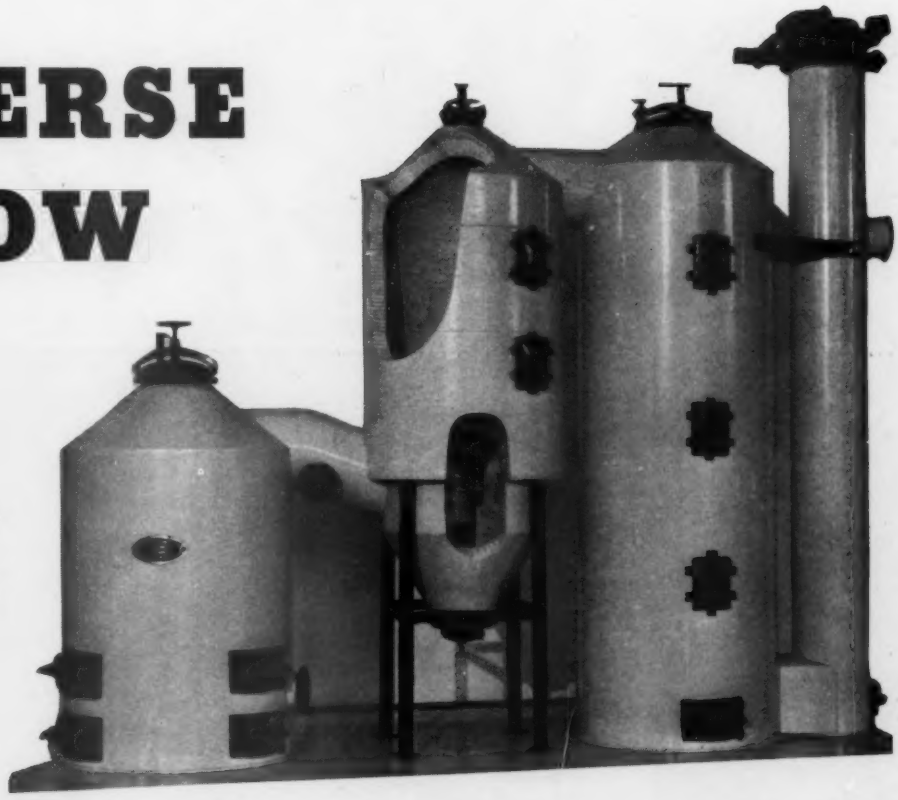
REVERSE FLOW



Model of Reverse Flow Water Gas Machine displayed at 1936 A. G. A. Exhibition. Patents Applied For.

A New Principle for Water Gas Manufacture

Time honored concepts were shelved when Semet-Solvay designed this new Reverse Flow Carbureted Water Gas Machine to meet today's operating demands.

• In this machine, gases travel upwards in the generator and carburetor while heating and enrichment are in progress. The result is a new standard of efficiency that makes for increased capacity, longer gas making per cycle, greater utilization of gas making materials, improved heat balance throughout the set.

• Reverse Flow can be built into any existing machine and give better results with either regular gas oil or heavy oils. It is recommended for high B. T. U. standby.

• The principles underlying the Reverse Flow design have been accepted with enthusiasm by scores of water gas engineers. We are confident that this machine, with its promise of better results, will become the first choice of the Gas Industry.

• Write for descriptive literature which tells the Reverse Flow story and pass it around among your engineers and operators. Should your capacity requirements call for equipment changes, we would like an opportunity to submit estimates, showing what you could expect from a Reverse Flow installation.

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ENGINEERING CORPORATION

Engineers *Contractors*

SEMET-SOLVAY ENGINEERING CORP. WE SELL SOLUTIONS TO HARD PROBLEMS NEW YORK

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YOU CAN SEE that this new 1937 Servel Electrolux is the "tops" in beauty! And when you open the door, you'll appreciate *all* that has been done to make it an even greater gas refrigerator than the ones that have been winning so many loyal friends during the past ten years!

It's roomier, with increased storage capacity in every model! It has extra ice cube capacity—more cubes for every size! And it's equipped with a wealth of time- and labor-saving features that every woman will love!

And improvements have not stopped there! We've made this new gas refrigerator *more* efficient—something even *we* didn't believe possible! Owners will be delighted with its still *lower* operating cost, as well as with its famous silence and freedom from moving, wearing parts.

We believe you'll agree that here is the finest gas refrigerator ever built—and that it will mean *more sales* for you this Christmas!

THE FINEST EVER BUILT!

New Sparkling Beauty
Smartly Restyled Interior
Attractive New Hardware
Every Modern Convenience
Greater Ice Cube Capacity
Improved Efficiency
Increased Storage Capacity
Even Lower Operating Cost
Permanent Silence
No Moving Parts to Wear

1937

SERVEL ELECTROLUX READY NOW FOR Christmas Sales

Here's how to make the most of it in your holiday selling

NOT FOR YEARS has Christmas held such promise for gas refrigeration sales! This season, people of every class have more money to spend—thanks to pay increases, special bonuses, extra dividends. They're in a spending *mood*, too. And the opportunity of getting a new 1937 model gas refrigerator in time for the holidays provides a strong, *added* incentive to purchase their Servel Electrolux *now!*

That's why it will pay you to give wholehearted support to gas refrigeration activity during the coming weeks—to spread the welcome news of "Next Year's *Finest* Refrigerator Ready Now" throughout your community—to plan an intensive follow-up of your entire prospect list—and to take advantage of national Christmas advertising on Servel Electrolux by making fullest use of the following tie-in material, which will be available to you shortly—

1. **GIANT NATIONAL CHRISTMAS ADVERTISEMENT** for display purposes. This same four-color advertisement will appear in The Saturday Evening Post, December 12; Good Housekeeping, December.

2. **CHRISTMAS POSTER FOR OUTDOOR DISPLAY**—a striking poster, with the theme "Silent as Night."

3. **ATTRACTIVE HOLIDAY WINDOW DISPLAY** that will invite passers-by into your showroom.

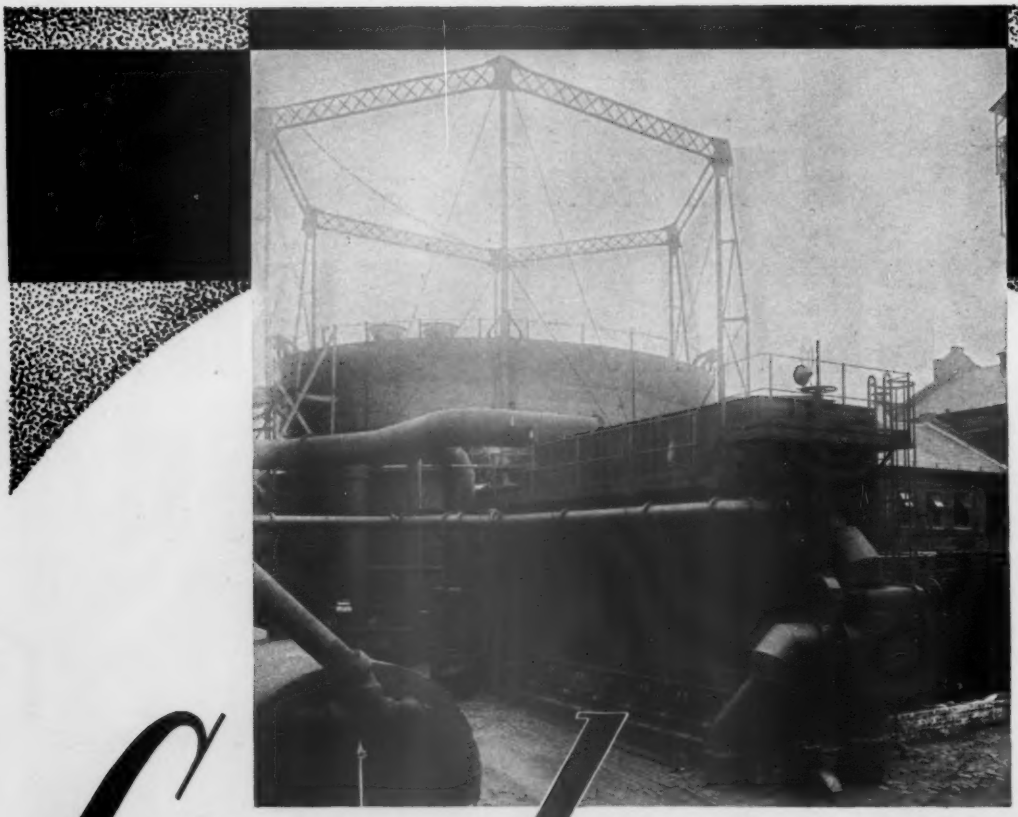
4. **NEW 1937 SERVEL ELECTROLUX CATALOG FOLDER,** full of essential information about "next" year's *finest* refrigerator.

5. **DRAMATIC ADVERTISEMENTS FOR YOUR LOCAL PAPERS** to direct fond husbands and wives to your showroom this Christmas.

This material has been specially prepared to help you do an outstanding sales job this Christmas season. For assistance in working out your holiday gas refrigeration plans, write, wire or phone to Servel, Inc., Servel Electrolux Sales Division, Evansville, Ind.

SERVEL ELECTROLUX

THE *Gas* REFRIGERATOR



Condensers

THE BARTLETT HAYWARD HIGH DUTY CONDENSER gives you exceptionally high efficiency together with a low gas pressure loss.

Various types of these condensers are built in different sizes and shapes, such as circular, oval or rectangular, to assure the best performance under local conditions.

They are constructed with small diameter vertical cast iron water compartments for salt water. For fresh water, they are of all-steel construction. Other materials are used where conditions make them advisable. Special designs with direct contact towers, either with or without packing are available.

The open top design makes cleaning of the tubes easy without taking the condenser out of service.

No matter what problem confronts you, if it is relative to the manufacture or distribution of gas, the Bartlett Hayward Division is qualified to assume entire responsibility. This includes complete gas plants from design to construction, individual apparatus, inspection, repairs.

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VOLUME 145
NUMBER 6

AMERICAN GAS JOURNAL

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NUMBER 3756

ESTABLISHED 1859

DECEMBER, 1936

Contents

Employer-Employee Relations in the Gas Industry—Glenn Gardiner 9

How to Avoid Liability for Injuries—Leo T. Parker 11

Gas Utility Co-operation with Master Plumbers—Geo. L. Bird 13

Some Miscellaneous Thoughts on the Future of the Gas Industry 14

How to Make Air Conditioning Build More Gas Househeating Load—Carl B. Wyckoff 16

Pipe Corrosion and Coatings—Erick Larson 19

Refractories for Water-Gas Machines—Chas. H. Hughes ... 23

How Commercial and Industrial Jobs Have Been Sold—Harold E. Jansen 29

A Recapitulation of the Progress Made in Applying Summer Gas Air Conditioning to Industrial Plants—By Chas. W. Swenson 32

Cement Mortar Protection for Distribution and Service Lines—Dennis J. Manning 35

The Eyes Have It—J. J. Stapp 36

Draft Hoods Group Proposes New Standards 37

New Equipment and Appliances 38

Gas Fired Tempering Furnaces Reduce Fuel Cost 41

Mystery Chef Radio Program Goes Into Second Year 42

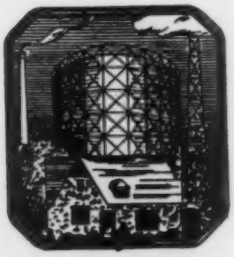
News of the Gas Industry 44

PUBLISHED MONTHLY BY
AMERICAN GAS JOURNAL, Inc.
53 Park Place, New York

S. G. KRAKE, *Publisher*
A. M. GLEASON, *Secretary*
A. I. PHILLIPS, *Editorial Director*

ADVERTISING REPRESENTATIVES:

THOMAS MORGAN, *168 N. Michigan Ave., Chicago, Ill.*; HARLEY R. MANKIN, *515 Guarantee Title Bldg., Cleveland, Ohio*; NORMAN C. NOURSE, *861 Market St., San Francisco, Cal.*; ARTHUR K. AKERS, *Tutwiler Hotel, Birmingham, Ala.*



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Subscription $2.00 per year U. S. A.; $3.00 Canada; $4.00 Foreign. Single copies, 25 cts.

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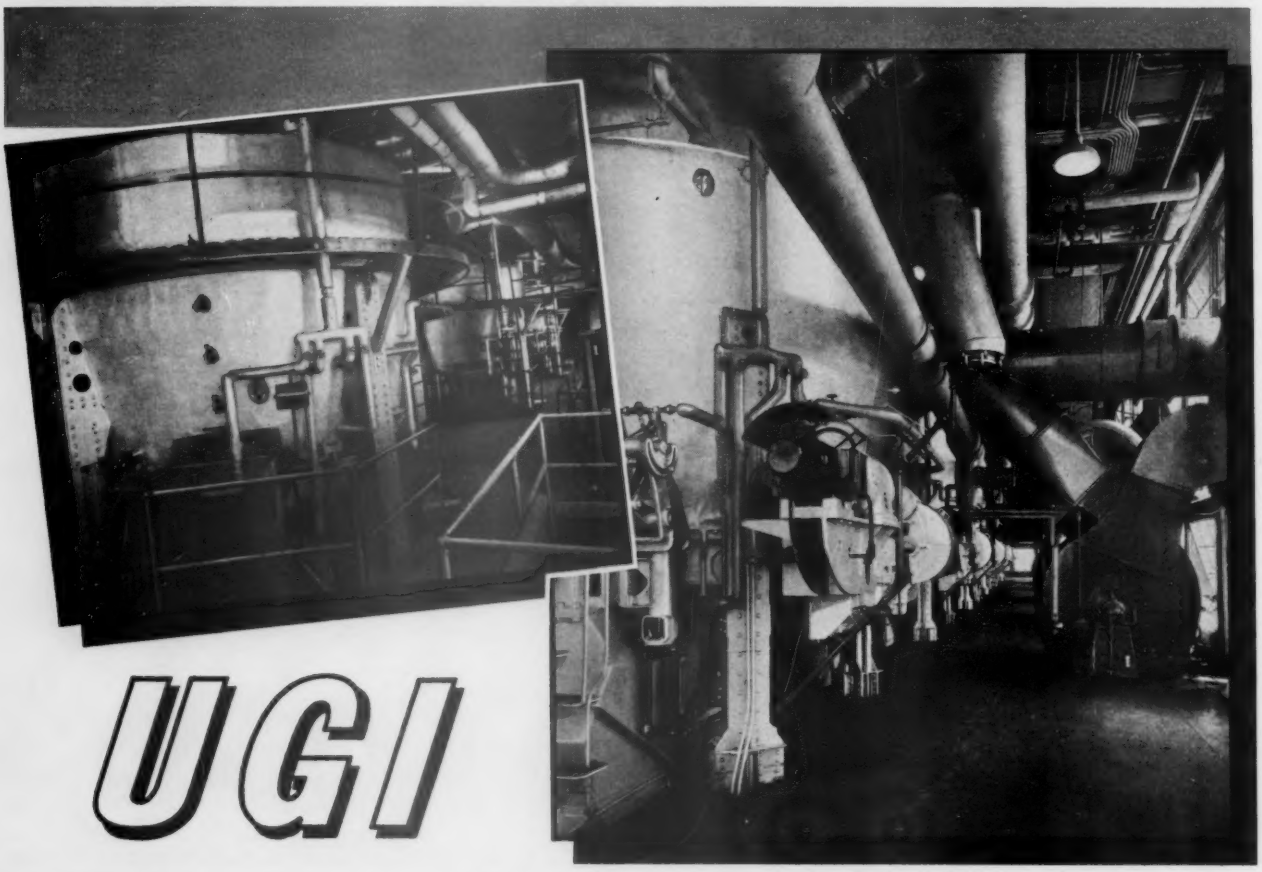

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DECEMBER
1936

AMERICAN
GAS JOURNAL

VOLUME 145
No. 6

Employer–Employee Relations in the Gas Industry *

By
Glenn Gardiner
Assistant to President,
Forstmann Woolen Company, Passaic, N. J
Vice President,
American Management Association

EMPLOYER-EMPLOYEE relations is an important question today, not alone to those scattered individuals in industry, known as personnel men, but an important question to every operating and management executive.

Let us briefly consider the background of today's situation in order that we may understand more clearly where we stand right now, and what may be expected of us in the future if we are to make the most of our managerial opportunities.

The depression set up circumstances which tended toward the development of unhealthy attitudes on the part of workers. I think a great many of the hardships of the depression found an explanation in the minds of the workers in what they considered the neglect, on the part of employers to do a great many things which they felt should have been done for them.

When a man feels insecure in his job, and when many men lose their jobs, there develops a feeling of unrest. Old loyalty crumbles and disloyalty arises, and also some new loyalties arise which are not always helpful.

Effect of NRA on Employee

Then came a period in which a great deal of legislation of national character began to fill an important place on the horizon of industry. Conspicuous in that legislation was the N.R.A. It put into the spotlight the relationship between employer and employee. It emphasized the idea that the worker had long been neglected and that it was necessary to enact legislation in order to protect the rights of the worker.

The N.R.A. promised a great deal to the workers. They expected a great deal more out of it than they got. Their hopes were raised to heights which were impossible of fruition. The effect of that legislation was to develop a new actueness in this whole question of employer and employee relationships.

N.R.A. brought to the foreground a great deal of new emphasis upon this question and it set up what I consider the false premise that it is necessary to legislate in detail the relationships between employer and employee.

Other Economic Plans

Now we have the Social Security Act, which we cite as another evidence of the spotlight which has been directed through legislation, upon this whole question of employer-employee relationship.

We have also had as a part of the background of our employer-employee relationships the development of a considerable amount of unsound economic theories, such as the now apparently extinct Townsend Plan. But the fact that millions of people subscribed to that wild and fantastic idea is evidence of the credibility of people, and that credibility still exists and may only be sleeping.

Also there is the idea that we can cure unemployment by the 30-hour week, a fallacy with which you are all familiar and to which you need not be exposed further.

So it seems to me that you as managing executives in a great industry must face this problem of employer-employee relationships with all the intelligence you have devoted to production, merchandising and financing in the past.

Practical Points of Relationship

I am talking about this question of employer-employee relationships from the practical angle with which we have to face our problems in business and industry. The gas industry has these problems and the solution of them is just as important as in any other industry.

Yours is an industry in which you have a pretty fixed proposition; your prices are pretty much fixed and outside of your control. In addition you have competing utilities which have products that will do the same things your product will do—electricity and

* *Abstract of an address delivered before Eighteenth Annual Convention American Gas Association, Atlantic City, N. J., October 26-30, 1936.*

oil, for instance. You have a problem of meeting this competition of other utilities and you must do it on a basis of rendering better and more efficient service with the product you already have.

At the same time your management has certain insistent demands from the workers for an ever-increasing share of the company's income, so that the problem of your industry, probably more than many others, is a problem of internal efficiency and economies of operation.

Increased efficiency and lower cost of operation is largely dependent upon a cooperative personnel. In fact it is well-nigh impossible without the goodwill of workers. They are not under one roof and under the same close supervision which exists in many industries. That makes it all the more important that in the heart of every one of your employees there is loyalty and satisfaction, so that they will do their duties out of sight of supervision, conscientiously and well.

The increased efficiency and lower cost of operation is dependent upon the cooperation and loyalty of your workers and it is of paramount importance.

Service Requires Loyalty

Service to your customers certainly depends upon a loyal force. That is true of your operating personnel as well as contact employees. There are many little things that may be done by employees which influence your customer good-will and you can ill-afford to overlook the possibilities of developing a more loyal personnel and consequently a higher degree of customer good-will.

I suppose you have gone further in your industry than many others in the training of your contact people because it is part of your merchandising, but you have the same problems of employee satisfaction going all the way back to your operating units and to your operating personnel, which never comes in contact directly with the public.

Wage Levels

Another angle in the economics of employer-employee relationships is that wage levels are not the sole factors in determining labor costs. Wages are high or low, in terms of costs, on the basis of the results which those wages get. It is conceivable that you could pay a low wage scale and have a higher labor cost than if you paid a high wage scale. What your wages get in service determines whether your labor costs are abnormally high or low.

I maintain that regardless of what your wage scale is you must get all of the man on the job and your relationships and your contracts with him as employer to employee must be such as to inspire him with some desire to be loyal and cooperative.

Public Good Will

We know that good employer-employee relationships are becoming more and more important to the winning and holding of public good-will. All of this background which I referred to earlier has not been lost on the general public. All of these things which have developed in the worker an attitude of insistency, have educated the general public to an awareness that employer-employee relationships are something of great importance, and today we see these relationships making the headlines in our papers. The general public, therefore, is more aware of them than ever before, and you as executives cannot afford to let your employer - employee relationships go haphazardly in the face of this situation.

The utilities need all the public good-will they can muster to their support. I don't need to emphasize that angle because as a rank outsider I am conscious of it, and all I know, like the late Will Rogers, is what I read in the newspapers, and I see enough in the newspapers to realize that you fellows are "on the spot." I don't know why, but you are, and you might as well face that fact. You are on the spot in the eyes of the public, whether you deserve to be or not.

For the sake of winning and maintaining public good-will, you cannot afford to allow your employer-employee relations to drift.

Selecting Employees

What sort of a program of employer-employee relations need you adopt or carry out in order to fulfill the requirements of the situation today? I am not going to dwell so much upon the detailed things which you should do because I understand that your Committee on Personnel Practices has rendered a report and has data available. But we do know that somehow, whether it is done in a personnel department or through a superintendent, or whoever is responsible for these functions, there are certain things that must be done and done carefully, starting out, of course, with the proper selection of new employees.

You should start out with a sound basis of selecting employees and then when they are on your payrolls comes the necessity for fair and intelligent wage administration, not leaving that to haphazard arrangements.

You should have some sort of a fair-deal procedure in dealing with your workers, not accomplished by any elaborate machinery of any kind but worked down through the line of executives and supervisory organization. Just because you don't get complaints from your workers is no indication that everything is rosy and bright.

Anticipate Possible Complaints

You can be sure there are many little things which do not loom large enough in the individual instance to occasion an outright complaint, but don't wait to hear about such a complaint before you start doing something about it.

Assume that the way to avoid complaints is to prevent them and so set up some basis of fair deal procedure if it is not any more than getting your executives and supervisors together and thoroughly impregnating them with the idea that this is a day in which employer-employee relationships are assuming a position of utmost importance and that they have a new and distinct responsibility in that respect.

Your employee relations program should in some way provide for a careful analysis of the jobs that are done and there should be some well-understood program of promotion so that the workers have some idea of where they are going if they succeed and do their jobs satisfactorily. Don't let that drift just because you do not have a lot of complaints about it. There is no greater incentive to your workers than to realize that they are working in an organization where there is some chance to get ahead and if you don't keep those channels open it is going to be too bad for your industry.

One of the things which above all others distinguishes American industry from a great deal of foreign industry is the idea that a man can go from a low job to the presidency if he "has the goods". That idea should be retained as a very distinct possibility in your set-up.

Accident Prevention

A question which should always be included in any employer-employee

(Continued on page 52)

How to Avoid Liability for Injuries

By

Leo T. Parker

Attorney at Law, Cincinnati, Ohio

DURING the past few weeks the higher courts have rendered several unusually important decisions particularly interesting to gas company managers, executives, and other employes who desire to minimize liability for injuries to employes, and for injuries caused by employes.

Of course, the law is well established that every one must take "ordinary care," or negligence exists, when one has violated a duty which he owes to another to prevent injury. This rule of the law is applicable under all circumstances.

Therefore, any one, as an official of a gas company, may be liable in damages if he violates any duty which he owes to an employe.

For example, in Hoeverman V. Feldman, 265 N. W. 580, the records show that at the time an employe took employment he was instructed by a foreman of the company as to the safe and proper method of performing the work.

One day an official of the company ordered the employe to perform the work in a different manner, which resulted in severe injury to the employe. He sued the official for damages and alleged that the latter knew, or ought to have known, that performing the work as directed and ordered by him was inherently dangerous and that his wrongful direction was directly responsible for the injury.

In holding the official personally liable in damages to the employe for the injury, the court said:

"It is our opinion that in cases which involve the right of a third party to recover from an agent, the latter is individually liable if he has breached some duty which he owed to such third person. This rule we think simplifies the law of negligence applicable to such situations."

Obviously, if this employe had been experienced in the work assigned to him, the official would not have been held liable because an experienced workman is expected by the law to use his own judgment regarding erroneous instructions and orders given by any superior. However, in this case the employe was inexperienced and the official was held liable in heavy damages for giving incorrect orders to the employe.

Law of Negligence

Contrary to the belief of the majority of gas company officials a contract is void and ineffective by which an employe contracts to relieve the company from liability for an injury caused by negligence of the employe's superior. Moreover, a contract is void if the employe, by any means or method, is caused or permitted to sign the agreement when not knowing the exact obligations expressed therein.

> ***"A Gas Company never is liable for an injury sustained or effected by an employe, except under circumstances where the employe is actually performing an authorized act for the Company."***

In many instances gas companies settle with injured employes and the employes sign releases for all further or other payments for the injuries. It is important to know that a release of this nature is void if the employe did not know, at the time he signed the document, that he was signing a release of all further claims, or if the injury resulted from negligence of the gas company.

For illustration, in Downey V. Kansas City Gas Company, 79 S. W. (2nd) 1063, it was disclosed that a gas company employe was employed to install hot water heaters on the premises of persons to whom the company was selling the appliances. While performing such duties, his eyes became irritated, sore, poisoned, and diseased as a direct result of soot, ashes, lye, potash, cresote, acids, and other chemicals and chemical combinations in many flues and chimneys.

After the employe had been in the hospital for a short period he signed a release, in part as follows:

"Know all men by these presents, that Robert R. Downey, of 2909 Garfield, Kansas City, Missouri, for the sole consideration of eighty-one and 90/100 dollars to him paid by the Kansas City Gas Company, the receipt of which is hereby acknowledged, do hereby release and forever discharge the Kansas City Gas Company, its successors and assigns, from all actions, causes of actions, suits, controversies, claims and demands whatsoever for or on account of injuries received. . . ."

Later the employe filed suit to recover compensation contending that he did not know what he had signed when he received the check for $81.90. Since the company did not prove otherwise and also because the injury was held to be caused by negligence of the company officials in instructing the employe that there was no danger in getting the soot into his eyes, the higher court held the employe entitled to a verdict for $1,500 for the injury, saying:

"There was some attempt to show in the record that a final receipt in settlement of an alleged claim before the Workmen's Compensation Commission for this injury, amounting to $81.90, was executed by plaintiff (employe); but this was denied. . . . and he explained on his part by saying that, if he received and indorsed any check for that amount, he did so under the belief that it was . . . in payment for the wages he lost while he was in the hospital for the treatment of his eyes."

Scope of Employment

The ruling of law regarding injuries to employes, or caused by employes, is certainly established under the laws of all states that a gas company never is liable for an injury sustained by an employe, or effected by an employe, unless the latter was acting within the course or scope of the employment when the injury occurred.

Frequently, officials and executives of gas companies have incurred liability for injuries to employes, or in-

juries caused by employes, when it was believed that, under the circumstances, the employe was *not* acting within the scope of the regular employment.

For illustration, the general law is that an injury does not arise "in the course of employment" when it occurs while the employe is on his way to work and before he has reached the premises of the employer or the place where his work is to be done. The exceptions to this rule are, namely: Where the gas company furnishes transportation to the place of work or the employe travels over a road expressly or impliedly authorized by the employer or while the employe is traveling upon the premises of the employer, or is coming from a place maintained by the employer for the use of the employes as an incident of their employment, or where the employe is using an automobile or other vehicle furnished by the company or bringing property or money or some report or message connected with or pertaining to the company's business, or when a company official controls, or has the right to control, the conduct of the employe.

Therefore, it is quite apparent that a gas company is not liable for an injury sustained by the employe, and it is not responsible for an injury effected to another by the employe except under circumstances where the employe may be considered to be actually performing an authorized act for the company.

For illustration, in Hantke V. Harris, 54 Pac. 293, it was disclosed that while an engineer of a plant was going to work in his own automobile he negligently collided with another motor vehicle causing serious injury to the occupant. The latter sued for damages contending that the company was liable because it paid the engineer a part of the expense of operating the automobile. However, the court held the gas company not liable, saying:

"Freytag (employe) was taking a course of his own choosing, had no property of his employer, was on no mission in the interest of his employer, was not in the pay of his employer, and was not subject to the orders of his employer until he arrived at the plant."

It is, therefore, established that before a gas company is liable in damages for acts of an employe, it must be shown that the relationship of principal and agent, or employer and employe, existed at the time the damage was done, and that the employe was acting in the course of his employment. The term "in the course of employment," means "while engaged in the service of the master," and is *not* synonymous with the phrase "during the period covered by his employment."

Now, in order that readers may with dependability determine under what varied circumstances an employe actually is "in the course of his employment," and avoid similar employment conditions, several recently higher court cases will be concisely reviewed in which the employes were held to be acting "in the course of the employment" and the employers were held liable in damages for injuries caused others by employes. These cases are as follows: Robertson V. Olson, 181 Minn. 240. The employe was returning unused material to his employer in the latter's truck; Elliason V. Western, 202 N. W. 485, the driver was returning to his employer with delivery slips and money; Caver V. Eggerton, 157 Miss., the hour of employment had arrived which was 8 A.M. and the collision occurred at 8:10 A.M. and the driver was on his way to the employer's plant to take his first delivery; Schmitt V. American, 42 S. W. (2d) 969, wherein it was the duty of an employe on certain days to leave home earlier than usual and perform work before reporting to the employer's place of business, and the accident happened while the employe was traveling from home to the place where the first work was to be performed; Sales Corp. V. Stayton, 45 F. (2d) 471, wherein the employe was driving a truck taking employes home by the consent and with the authority of employer, and was transporting tools and material of employer at time of collision; Kuehmichel, 145 N. W. 788, wherein the employe was working during the period covered by his wages of employment; Auer, 103 N. J. Law, 372, where the employe was employed to devote his whole time to the service of the company, authorized to use his own automobile, and paid by his employer weekly for the upkeep and running expenses of his car.

When Employe May Recover for Injury

Unless an injury arises out of the scope of the employment an employe is not entitled to recover damages, or compensation under the Workmen's Compensation Acts.

The higher courts have held that employes are entitled to recover damages or recover compensation for injuries arising "from the course of the employment," in the following instances: Employe accidentally shot while attending to work. (109 So. 122.) Employe shot by holdup band while attending to work. (134 A. 611) Employe shot while returning from a journey authorized by his employer. (249 Pa. 653.) Injury of truck driver while walking from truck to residence. (153 N. E. 624.) Injury received by workman who left his work to get drink of water. Foreman injured while making things for his own home while in employer's plant. (129 S. E. 667.)

Injury to Minor

The general rule of the law is that a parent who hires his minor child out, or permits him to obtain employment, may stipulate the kind of work to be performed. Ordinarily, where the minor is employed with the parents' consent and is retained in the performance of the same kind of work, the gas company's liability for damages to the parents, as a result of injuries sustained, is the same as where an adult is injured. However, if the minor is changed to *more dangerous work without the consent of the parents* the company's liability is importantly increased, and in fact the company automatically becomes an insurer against any injury to the child.

For example, in a recent case which involved this point of the law, the court held that an employer who ordered a minor to work at a more dangerous occupation, without obtaining the consent of the parents, was liable for damages as a result of the injury whether or not the same was sustained through fault or negligence of the minor. In other words, under these circumstances the employer was held to be an insurer that the minor would not sustain injury in the changed vocation.

Duty to Protect Children

Ordinarily, a gas company is bound to keep all of its property which is open to the public in such condition that it is not unusually attractive to children. In other words, any appliances or equipment that is attractive to children should be removed to such location that it is not conveniently accessible.

On the other hand, it is important to know that if a child voluntarily participates in a wrongful act and is thereby injured by anything not deemed to be unusually attractive, the child cannot recover damages.

For illustration, in the leading case of Falardeau V. Malden & Melrose Gas Company, 175 N. E. 471, it was

disclosed that a gas company placed on its vacant lot some pipe. The evidence tended to prove that at some previous time "No Trespassing" signs has been placed upon the land. The lot was in a residential section of the city and for two years or more before the accident children in the neighborhood had made use of it as a playground, and it had been used by people to walk across to a neighboring street.

A child had its eye put out and was otherwise seriously injured when he fell while playing on the pipe stored there by the gas company. He filed suit to recover damages for the injuries sustained. However, the court held the child not entitled to a recovery, saying:

"No evidence was introduced to prove that the plaintiff (child) had any invitation from the gas company to be upon the lot, or had any right to be there, except such as may have arisen from the fact that for two years or more children had been in the habit of playing there and that the land was used by people to walk across. . . . When the plaintiff ran, walked or stepped upon the pipes of the defendant he was not an invitee but became as to it a trespasser and for injury caused by such act of trespass can recover only by proof of wanton and willful misconduct on the part of the defendant (company)."

On the other hand, in several higher court cases, companies have been held liable in damages for injuries sustained by children on such equipment as a red wagon; peculiar shaped pipe painted an attractive color; an excavator having wheels operated by hand on the top; a turntable. All of the devices were held to be "attractive nuisances" and the company was held to be negligent in permitting such attractive things to be left in a location frequented by children.

Under all circumstances where either children or adults are invited, or permitted without objection of gas company officials, to come upon the company premises, the company will be held liable for any injury which is negligently effected by any employe.

Statute of Limitations

In every state laws are effective which require a suit for damages or compensation to be filed within a specified period after an injury is sustained by an employe, or caused to another by an employe. If such suit or claim is not filed within this period the company ordinarily is relieved from liability.

However, if the employe is insane, or otherwise physically or mentally unable to attend to business transactions, this rule of the law is not applicable. The fact that the injured employe, or other person, is highly nervous is not sufficient excuse for failure to file the suit or claim within the period stipulated by law.

For example, in Tierce V. United Gas Public Service Company, Inc., 164 So. 446, it was shown that a gas company employe was injured in an accident on April 19, 1933. Suit was filed December 6, 1934, nineteen months and seventeen days after the date of the alleged accident. The employe contended that the reason he failed to file a suit or claim for compensation within the year specified by a state law was because he was mentally incompetent. However, since certain physicians testified that after his discharge on June 2, 1933 from the hospital he was capable mentally of attending to his business affairs, the higher court held the employe not entitled to recover compensation, saying:

"The preponderance of the testimony is that he was mentally competent after June 2, 1933, which was more than a year prior to the filing of this suit, and his claim for compensation had perempted and was forever lost."

While on the subject of mentally incompetent persons, it is well to explain that a gas company always is liable in damages for an injury effected another employe or person where such injury results from mental or physical incompetency of the employe.

Gas Utility Co-operation With Master Plumbers*

On several other occasions representatives of the National Association of Master Plumbers have appeared at meetings of the American Gas Association and urged cooperation between the members of the two groups. These appearances have, I believe, contributed in a large degree to the growing number of mutually profitable relationships between the two groups.

Looking at your merchandising problem strictly from your point of view, I see a marked intensification in the so-called "battle of fuels" and the increasing sale of gas appliances by individuals and groups more interested in gaining a profit from the sale of appliances than in the rendition of satisfactory service to the public. If I am correct on these two points it follows naturally that any organized group which proffers its sales and installation services is at least entitled to a welcome hearing.

Looking at this relationship between your group and ours from the Master Plumber's point of view, I feel it is desirable not only for the profit possibilities it affords; but also, and probably equally as important, as a means for establishing a contact with the ultimate consumer which affords a repeated opportunity to enter their premises in the search of sales possibilities for strictly plumbing and heating materials. So I believe that all Master Plumbers will welcome a closer bond between our two groups.

As I see the situation, there are certain fundamentals which characterize those satisfactory agreements which are now in effect. I shall enumerate them as follows:

(1) A written understanding between the gas utility and the Master Plumbers as opposed to a mere verbal understanding;

(2) A clear distinction in the written understanding, as to what constitutes an actual sale, what constitutes help to a gas utility salesman, and what constitutes development of sales prospects or "leads" as they are popularly known;

(3) A graduated scale of monetary reward dependent upon the type of service the Master Plumber renders in the consummation of the sale;

(4) A clear-cut understanding as to who, and under what conditions, is to make the installation of the appliance.

In an analyses of the complaints our National Association has received from its constituent bodies on the lack of cooperation between themselves and the gas utilities, I find that in all instances the complaint is based on the disregard of one or more of the four factors I have called to your attention. Either through your fault or ours we have disregarded these four factors in one respect or another, with the result that instead of a harmonious and mutually helpful relationship to extend the satisfactory use of gas we find, in some instances, our two groups at loggerheads with a resultant lack of profit to either of us, and a diversion of business to other fuels.

** Abstract of a paper by George L. Bird delivered before Eighteenth Annual Convention American Gas Association, Atlantic City, N. J., October 26-30, 1936.*

Some Miscellaneous Thoughts on the Future of the Gas Industry

IF there be any who are uninformed or who may be faint-hearted and skeptical regarding the future of the gas industry just because we now have real competition and must do some healthy, honest-to-goodness hustling in order to get business and hold it, we suggest that they examine the facts and learn of the real progress that is being made. For example, let them read the report of Major Alexander Forward to the recent A. G. A. Convention. We quote just one paragraph.

"Revenues of manufactured and natural gas utilities aggregated $520,507,800 for the first eight months of 1936. This was an increase of 6.8 per cent over the corresponding period of 1935. Revenues from industrial and commercial users increased 16.1 per cent, while revenues from domestic customers gained 3.0 per cent."

Then it might be well to look at gas appliance sales. Regarding these Mr. C. W. Berghorn, secretary of the A. G. A. E. M. says: "Shipments of gas ranges for the first eight months (of 1936) show an increase of 28% over the corresponding period of last year, and on the figures available we estimate that during 1936, 1,400,000 gas ranges will have been sold. On domestic house heating appliances tremendous gains have been enjoyed during the eight months' period for which we have figures available; gas fired boilers have increased 86%; gas furnaces over 148%; gas conversion burners 102%, and the gas fired steam radiator industry in the sale of its appliances shows an increase of 85%."

The electric industry, one of our keen competitors, loses no opportunity to point out the rapid increase in its business and the rapid decrease in the cost per unit of its service. The electric industry is young, and for the present it is natural that its rate of growth should be greater than that of the older and more stable gas business. How about a relatively new branch of our business—house heating, for example?

House heating sales in the natural gas industry are not generally segregated from other residential uses. Therefore we were obliged to confine our study to companies supplying manufactured gas.

The figures speak for themselves.

House Heating Customers and Sales Manufactured Gas Industry
(Compiled from A.G.A. Statistics.)

Year	No. Customers	Sales M.C.F.	Revenue	Av. Rate
1929	43,000	14,056,000	$11,787,000	.84½
1930	53,000	18,094,000	14,943,000	.82½
1931	58,000	19,582,000	15,747,000	.80½
1932	60,000	19,351,000	14,884,000	.77
1933	80,000	20,296,000	14,258,000	.70¼
1934	116,000	28,428,000	18,970,000	.66¾
1935	132,000	35,279,000	22,764,000	.64½

Indications are that the increase during 1936 will surpass any year heretofore. Apart from Mr. Berghorn's figures, which we have already quoted, it seems probable that the industry will end the year with at least 20 per cent more house heating customers than it had a year ago.

Gas refrigeration is another branch of our business which is expanding rapidly in many places.

Add to all of this an industry fully awake to the problems facing it, underrating rather than overrating its own service and its own strength and uniting to handle cooperatively those matters of national imporance to it. Add a history extending back a hundred and twenty years, and a background of success when faced with crises and difficulties seemingly more serious than the problems now confronting us. Does this present a picture of an industry struggling for existence? We think not. Rather the problem is: "How can we make use of present conditions to bring about the greatest future success?"

On this point Mr. Francis B. Richards in his recent address as Chairman of the Council of The Society of British Gas Industries brought out some very sound

thoughts and basic principles. In opening his address he told of discussing a problem with one of his employees, and the employee said: "It seems to me, sir, that there are three things a man requires to know, Where he is, Where he is going to, and How he is going to get there." Then continued Mr. Richards: "I trust that you will agree with me that the present is a very opportune moment for us to take stock of the position in the Gas Industry and to try to see Where we are, Whither we are going, and How we are going to get there.

"Since evolution is the basic principle of all life our Industry must accept this principle, and with it its natural corollary—the survival of the fittest. The Gas Industry is so important to the welfare of the community that our affairs—whether we will or no—are a matter of public concern. Our conduct of them constitutes the discharge of a trust for the public at large, and we shall sooner or later be called upon to account for our stewardship and to show that we have served the community to the best advantage. It will then be for us to prove that we have done everything we could to bring the service of gas within the reach of the widest circles at the lowest prices by availing ourselves to the fullest extent of the means placed at our disposal by the discoveries of science and advancing knowledge of business methods.

"The process of evolution then confronts us with the necessity:

Firstly, To study the requirements of the consumer and to supply his needs at a price he can afford to pay, remembering that he is an evolutionary being and that what was good enough for him yesterday will not be good enough for him tomorrow.

Secondly, To study our corporate structure and our methods of manufacture and distribution to see that we have left nothing undone that would conduce to the better discharge of our obligations.

Thirdly, To accept the necessity for collective action and co-ordination if we are to survive, and to see that such action in our Industry leads to growth and progress and does not lead to inflexibility and complacency.

Fourthly, To keep constantly before the public we serve what gas can do and is doing for their convenience and comfort; to show them that gas is modern and progressive—in short to make them 'gas-minded.'

Finally, To realize that the individual is the ultimate unit upon whom all progress depends, and to see that in any growth of collective action or co-ordination the individual has ample scope and encouragement.

"Unless we in the Gas Industry ourselves plan our future in such a way as to command public confidence, then we shall have only ourselves to blame if—in the name of public welfare—the work of planning is undertaken by others."

A sound philosophy is this rather than a recommendation of specific objectives. We need both. In fact we need the thought which results in the establishment of broad general principles and aims; we need the crystallization of that thought into definite goals to be reached, and we need the action which converts those thoughts into achievement.

Returning to the question: "How can we make use of present conditions to bring about the greatest future success," we offer one suggestion by way of example. No longer ago than this morning the Editor sat in the office of a prominent attorney, who is only incidentally interested in the gas industry. He excused himself long enough to make a telephone call to a title insurance company. The results were quite evidently unsatisfactory—the information he wanted had not yet been prepared. His comment to the Editor was that all the title companies were way behind in their work because the large amount of building, either being planned or actually in progress had resulted in an exceedingly large volume of requests for title searches and insurance. Here was definite evidence of the coming building boom about which we heard at the Atlantic City Convention.

Members of the gas industry, are you keeping track of building permits in your territory, and are you in touch with the architects and contractors to make sure that gas burning equipment is specified? Here is a real opportunity.

How to Make Air Conditioning Build More Gas Househeating Load

By

Carl B. Wyckoff

Public Service Company of Colorado, Denver, Colorado

FOUR years ago air conditioning was not only almost impossible to sell but few were well enough informed on the subject to get a job properly installed even though it could be sold.

The Public Service Company of Colorado were well aware of the potentialities and fully appreciated that air conditioning was just another step in the evolution of better living the same as its predecessors, the electric light, mechanical refrigeration, automatic gas househeating and other numerous improvements. They, therefore, figuratively speaking, went into a huddle on the subject with many angles to consider. Being a combination company some thought was given as to which department would handle the activity, the electric or gas sales division. Some favored the former as there was little increase in gas load, others felt that it would be well to develop a separate group but these thoughts were soon laid aside and the responsibility was placed with the gas househeating division. This has proven quite wise and should require no argument.

Having been active with househeating, first with artificial gas and then for four years intensively so with natural gas a well trained organization had been developed. That these men were of the best class of substantial and capable salesmen was due to the company's wise policy of maintaining this activity year in and year out, good times and bad rather than the sadly mistaken idea of sudden spurts and drastic retrenchments. Thus the city of Denver was well covered by a group of men who not only knew the heating business but who knew and had the confidence of their customers. This relationship having been established by the satisfactory heating jobs they had installed. With this entree established the next step was to properly equip and educate these men on air conditioning.

Home comforts abound when healthful, invigorating, outdoor air, such as you find on the banks of a mountain lake, is circulated through the house.

Fortunately there was in the organization a man who had years of experience in heating and ventilating and who had made an intensive study of air conditioning. This man in addition to being a splendid salesman was quite capable of handling the engineering.

Thus after much consideration as to equipment to handle the activity was launched. Realizing that there was much to learn from practical experience and that it would take time, haste was made slowly and the matter was handled with extreme caution. Only those jobs that could be sold right were attempted. This proved quite a task for there was not only the job of making the sale and planning the lay-out but the training of the craftsmen in making the installation. These jobs were nursed from their inception to completion with the result that as time went on a number of jobs were accumulated, of which the company could well be proud. The wisdom of this policy was evidenced by the absence of grief during the pioneering of this field. All installations proved quite satisfactory and the company felt that with the two years of valuable experience and the better public acceptance attained they were in a position to proceed with a well defined program. No intensive advertising was done but a very nice pamphlet entitled "The Air You Breathe," was prepared and dis-

tributed to a selected group of prospects.

Sales Resistance Decreases

By this time the public had become more air conditioning minded and sales resistance was decreasing but there still remained a great deal to do in educating all concerned from the architect to the workmen making the actual installation. The job certainly cannot be figured out on a shingle. In the past the public has put up with poor heating plants because they knew no better. Their job was as good as their neighbor's so even though the furnace was undersized, with warm air pipes installed with split registers and outside cold air returns or one in the center of the house at the best, they thought they had a heating plant.

Expert Analysis Required

With air conditioning much more is expected and must be given. The air must be refrigerated or cooled in some manner in the summer time. Also it must be cleaned and either humidified or de-humidified as the condition may be. Further it must be kept in motion.

All these things require a complete knowledge of the subject and expert analysis of each individual job.

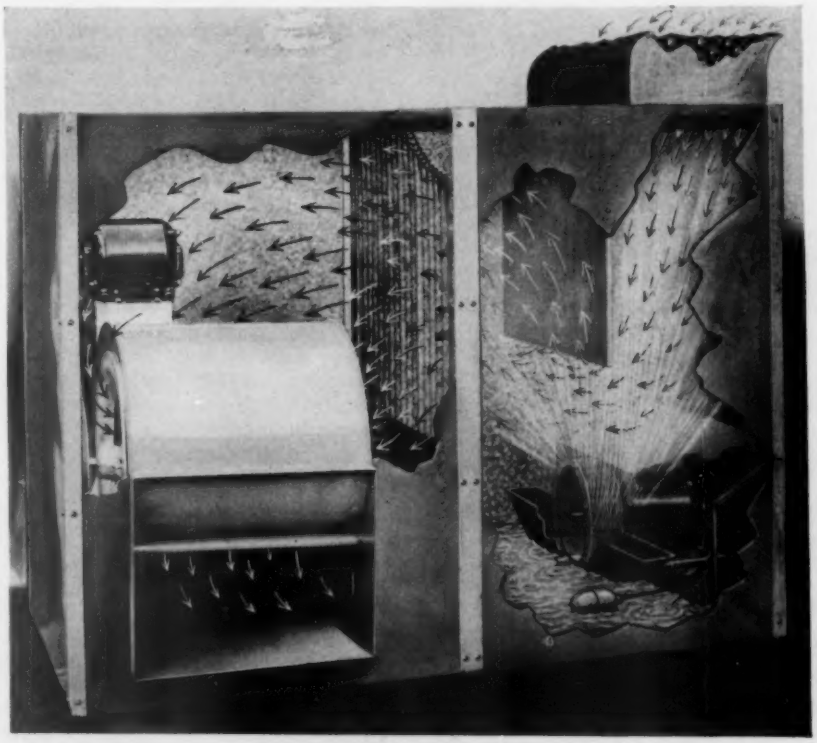
Throughout a large area surrounding Colorado, and particularly to the north, south and west, the low relative humidity prevailing permits a ten degree drop in dry bulb (which is sufficient), during the fifty day period when cooling is required, by the evaporation of the water used in cleaning and washing the air of pollen and other irritants without increasing the relative humidity to a percentage detrimental to health and comfort. Incidentally while not only very economical this produces a very desirable effect upon the occupants of air conditioned homes. In this area the winter indoors atmosphere is ordinarily so dry that much inconvenience is suffered by dryness of the respiratory system, also with proper air conditioning, sufferers of hay fever, asthma and such ailments usually receive a great deal of relief.

The above conditions are quite a help in selling year around air conditioning as both the installation and operating costs are lower than other districts. This is offset, particularly in Denver, by the lack of demand for summer cooling. In fact the average house is comfortable at all times and rarely uncomfortable from either high temperature or relative humidity. Therefore it is necessary for our company to consider all year around air conditioning.

Training of Salesmen

The company's program does not necessarily include the training of each and every salesman to a degree where he becomes an expert air conditioning engineer, but he is so trained that he has a splendid general knowledge of the subject and is in a position to present the matter intelligently and to discuss it authoritatively and to sell the customer on the idea.

the gas industry should capitalize this opportunity and take full advantage of the situation while it is comparatively young. A number of extremely good househeating customers have been secured in Denver solely through the effective presentation of the air conditioning story. More than one householder is now using gas heat, who refused to even consider this fuel until forced to admit its necessity in connection with proper conditioning of the air in his home.



A popular type of air conditioning equipment consisting of spray chamber and blower housed in cabinet. Washed and humidified air passes into distribution ducts.

It is by no means intended to lessen the activity on increasing the gas househeating load but it is felt that the two activities belong together and that the company is fortunate in having such a well trained organization to carry on this new work. The public is lending its ear more and more to air conditioning and what would be more out of place than trying to supply a home with pure clean washed air heated by any other source than automatically controlled gas. So as air conditioning goes, so goes gas househeating. Thus

With The Public Service Company of Colorado the air conditioning engineer is assisted by a small staff of specially trained men who work under his directions, lay the work out and assist in the supervision of the installation.

Air conditioning is by all means a highly specialized activity and the engineer must not only periodically give talks and lectures to the salesmen, but he must inspire the confidence of the architects and builders.

He will also have to train the workmen in their installation work. In this way those concerned can be inspired to look to the gas company for guidance, which is a desirable attainment.

The essentials of a good air conditioning job are:

Proper humidity in each room.

Proper temperature in each room.

Proper number of air changes in each room.

Proper amount of outside air (modern construction being so tight).

Properly concealed duct work—both warm air and returns.

Proper register locations.

Complete and thorough control system.

Neatness throughout entire system.

Proper cleaning of air.

Elimination of noise.

Elimination of odor.

While an existing heating plant can be very materially improved still the best jobs are secured through active cooperation with all concerned in new homes from the time the plans are drafted until the last detail of the home is completed.

The air conditioning engineer lays out the system and follows the work through very closely with the various contractors. This facilitates very much the concealment of ducts as joist and stud space can usually be designed so as to accommodate these ducts when they are anticipated. The plumber is instructed to arrange for proper drain to permit periodical cleaning of machine with the minimum of inconvenience. Separate electric circuits are provided for air conditioning to prevent lights from dimming when motors go into operation.

Heat Loss Computation

For the general sizing of ducts and equipment standard coefficients are satisfactory; however experience has taught that certain parts of the home require special consideration and it is felt worth while to give these rooms consideration. Basement rooms such as laundry, recreation, dens, spare bedrooms, etc. do not receive enough heat when sized by using the heat loss above grade only, but when a temperature under floors and below grade of 40° F. is used, in addition to the loss through basement windows and exposed walls above grade, then and only then are the rooms comfortable.

Maid's room — experience has shown that this room seems to require more heat than the rest of the house. Many complaints are received on this room being too cool and by careful check it is found better to plan for 80° for this room. The modern bathroom with its tile floor and walls should be sized for 90°.

Sizing of Ducts

Balance each branch with the long run trunk, so as to have equal friction. That is—a register one hundred feet from the blower should have the same amount of friction to the blower, as one only ten feet from the blower.

No pipe smaller than five inches round, should be used on account of the questionable friction of small pipe and fittings.

Locking quadrant dampers are used on all trunks and branches. They should be placed as far from the registers as it is possible, to eliminate noise if dampering is found necessary. Dampering is usually required as conditions cannot always be anticipated. Some rooms will lose heat faster than others, different people demand different temperatures for comfort and various things will enter into the operation of the plant. When the valve in the register is depended upon to do this dampering, noise is often the result or members of the family are constantly changing it thus getting the entire system out of balance.

Workmanship

Good tin work, like everything else that is good, costs more than poor workmanship. All changes in direction of flow are made with sweep fittings and these transition fittings require skill. Therefore competent and thorough mechanics only should be employed and they should be paid accordingly.

Materials

Celotex is excellent sound absorbing material and should be used in all return duct work where city ordinances will permit. Where heat is used a number of cities will permit Thermax and it has a sound absorbing coefficient two times higher than plain celotex. It is however more expensive and must be sealed on the outside. Otherwise in furnace installations galvanized iron from 22 to 27 gauge should be used.

Registers

Register outlets should be as near the size of the stack as possible. A larger register than stack head, with high velocity, is of very little value due to orifice effect on stack head. Wherever practical all warm air registers should be placed between six and seven feet from the floor and on inside walls. In some few rooms the construction may not permit this height but they should be at that level if possible.

"A circulation of a large quantity of air through ducts as near the room temperature desired as possible is preferable to a small volume of extremely cold air."

Warm air baseboard registers create a draft on the floor with forced air. Those up to five feet are very apt to interfere with the placing of furniture or people in front of them are made uncomfortable by the blast of from 100° to 125° air hitting them.

Low registers, under four feet, seem to give high inside wall and low outside wall temperatures when low velocity is used. As much as 10° to 20° difference in floor and ceiling temperature is found while with 6′ 6″ registers a much more uniform condition exists.

Return openings should be as far away as possible from the blower and with some ells to absorb any noise Where this is not practical a celotex labyrinth placed in the duct is usually sufficient.

Condensation and Air Temperature

Considerable difficulty is experienced on some refrigeration jobs where temperatures too low are used due to condensation. A circulation of a large quantity of air thru ducts as near the room temperature desired is recommended rather than a small volume of extremely cold air to eliminate condensation, for more comfort and to prevent cold spots. The temperature of entering air should always be above dew point. When refrigeration is used the relative humidity in the ducts is usually very high and celotex ducts often get damp and give off an odor which is another reason for rapid circulation.

Relative Humidity

A number of executives do not appreciate the value of correct humidity. Some, especially those connected with straight gas companies, are not interested in air conditioning at all. Some feel that air cooling is important during the summer months but cannot see the advantage of winter air conditioning. They feel that the high relative humidity of their climate requires no correction. They do not consider the tremendous drop in relative humidity when real cold air is taken from the outside and heated up to a comfortable degree inside.

Outside air at 35° with a relative humidity of 55% when heated to 70° drops to 15% which is less than exists in Death Valley. The relative humidity on the driest desert is approximately 20% and we know how impossible it is for plant or animal life to flourish in the desert. Outside air is commonly colder than

(Continued on page 58)

Pipe Corrosion and Coatings

The Electrical Characteristics of Soil

Part 6

By Erick Larson

THE COMPLEXITY of the chemical characteristics of soils makes it desirable to find some criteria by which the corrosiveness may be indicated without the necessity for numerous chemical analyses of a large number of samples. Research and experience have indicated that there should be and there is a correlation between certain electrical properties of the soil and the rate of corrosion in many instances. Early in soil corrosion research it was realized that the vast number of chemical elements and compounds involved, made recognition of each individual destructive agent a practical impossibility. However, during the research it was noted that regardless of the nature of the agent producing corrosion, the general tendency was for the electrical resistance of the soil to decrease as the rate of corrosion increased. Of all the methods proposed or discovered, electrical characteristics of soil have proven to be the most extensively applicable, although limitations and disadvantages become more apparent though not insurmountable as experience increases.

Basic Electrical Principle

The basic electrical principle used in exploring soils to determine corrosiveness, is that the electromotive force required to cause a current to flow in a conductor is equal to the current times the resistance, which is expressed by the formula $E = IR$. In practically all methods a voltage is impressed on the soil and the current flow between two terminals measured, so that the resistance may be computed. Certain field instruments are constructed to read directly in resistance units to eliminate the necessity for any computations.

Soils, while not comparable with many metals, are electrical conductors. For the purpose of determining corrosiveness, interest is focused not so much on the scientifically accurate measurement of conductances or resistances of the soils but upon the relative values of these factors correlated with known rates of corrosion. The greater resistance a soil offers to the passage of an electrical current, the less corrosive that particular soil is apt to be. Being a relative value, comparisons are necessary, and therefore records of soils in which corrosion and particularly failure from corrosion has occurred or, as a substitute, accelerated tests of the corrosiveness of unknown soils may be resorted to.

General Limitations

Soils can not be distinguished as to their type or group by the numerical value of the electrical measurement. Neither is it possible by electrical measurements to classify a soil into the broad designations of acids, neutrals or alkalines. Fortunately, however, considerable correlation has been found to exist between the electrical resistivity of soils determined from field or laboratory measurements and the rates of corrosion. Recognizing certain factors causing inaccuracy or misinterpretation, electrical measurements do furnish an important guidance in determining the economics of protection. There is a higher percentage of accuracy in the correlation between the rate of pitting and electrical measurements when the value of the resistance of a soil is low, than when high and, therefore, practically all low resistance areas may be assumed as requiring protection, while areas of high resistance require added data and testing to assure accuracy of predictions.

Methods have been developed and found of practical value based on electrical determinations made in the laboratory rather than the field. The preferable method is to secure such measurements in the field, to avoid the complications of additional factors arising when bringing samples to the laboratory, although predictions based on field readings are subject to considerable variations and misinterpretation when sufficient substantiating data is not secured.

Effect of Moisture

The degree of soil saturation affects the value of electrical measurements. The values secured in a wet soil are frequently no more consistent or indicative than those secured in a dry soil, but by taking observations under both conditions, at least one numerical value will be indicative of more severe conditions than the others, and predictions based on the values representing maximum corrosivity are the more desirable for use in economic studies. The lowest resistance observed in a single soil type would be used, rather than the average, unless the minimum value was so grossly different from all others as to suggest an error when additional observations would be made to confirm the original. It would be an unsafe practice to simply discard a single extremely low resistance value without checking.

The selection of a time for field survey which would coincide with the percentage of saturation representative of the highest degree of corrosiveness is impractical. Tests conducted in the laboratory can control many of the factors ordinarily variable in the field, and it is, therefore, desirable to conduct experiments from which it will be possible to ascertain the factors by which field

values must be multiplied to produce values known to represent the maximum corrosive conditions which exist in the particular soil.

The resistivity readings taken in the field are therefore supplemented by gathering a few representative samples of each soil type at the time field measurements are made. The actual soil saturation is determined at the time the field measurements are made. Accelerated laboratory tests of the samples determine the rate of corrosion for varying prcentages of saturation. By plotting the rates of corrosion against percent saturation, the percentage of saturation at which maximum corrosiveness occurs may be determined. A factor may then be computed from which the field measurements

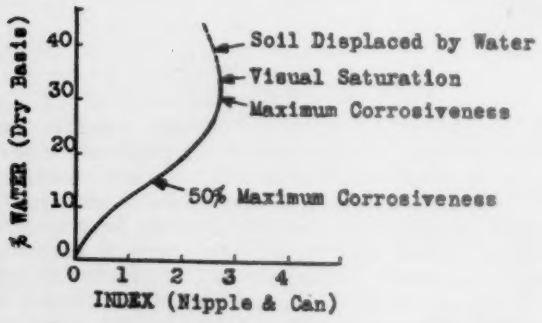


Fig. 1. Effect of moisture content on corrosiveness.

may be corrected to maximum values. While the maximum values thus determined may not represent the average conditions over a large proportion of the soil being surveyed, there are many highly localized conditions which warrant the use of the maximum value thus found.

An indication of the effect of moisture content on corrosion is provided in figure 1, which is from data by Corfield[1] who points out that the most significant point on a curve plotting an index of corrosion against percent of soil moisture content is that of maximum corrosion. This point can only be determined by experiments. Corfield indicates that the actual percent of the moisture content of the soil has no direct significance as to the rate of corrosion, until converted into the percent of maximum corrosion. Corfield found in all tests, that soils mixed with water until visibly saturated displayed the maximum rate of corrosion.

The percent of water content producing maximum corrosion has been found to be surprisingly uniform for all soils and locations tested by Corfield. This fact was the result of an exhaustive study of the average percent maximum corrosion in 45 soils, and a total of 225 tests which resulted in a value of 43%, compared with the lowest average of 32.5% and the highest 49.8%. More than one test was conducted on each soil and the average of the points of maximum corrosion tabulated for comparison with other types.

Rogers[2] found in numerous tests on alkali knoll soils, that there was an increase in the rate of corrosion up to approximately 13% water content, at which point the maximum rate of corrosion occurred. That considerable variations in soil moisture content occur during a year, is indicated by Figure 2 on data also by Rogers. Had field measurements been taken during September or October, considerable variations may have occurred between the predictions and actual results, but by means of the laboratory tests, the resistance readings at field saturations could readily be converted to resistances at saturations producing maximum corrosion, and the latter values used for designating protection. For local conditions it is frequently sufficient to determine only the maximum rate of corrosion by varying saturation, but to secure the advantages of ease of securing comparisons with other observers, and, to further substantiate the value of electrical methods, it is desirable to determine soil resistances at the point of maximum corrosion.

There may be differences in annual rainfalls as well as during the various seasons of a year. Corfield[1] reports a percent increase in rainfall in 45 locations between 1930 and 1931 and 1931 and 1932 of 43.6%, with a corresponding increase in corrosion of only 12.5%. The large increase in rainfall and considerably less percent increase in corrosion may be accounted for by the more rapid run off during heavy rainfalls, resulting in only a slight increase of soil moisture content.

Corfield also reports that under pavements, soils in general have a higher percent moisture content than the same soils not under a water proof seal. The seal has the property of preventing or lessening evaporative losses as well as decreasing the accessibility of surface waters.

Effect of Temperature

While moisture content is one of the most vital factors to consider, temperature may also have a bearing on the rate of corrosion, when electrical measurements are used as the criteria of the rate. The variations in

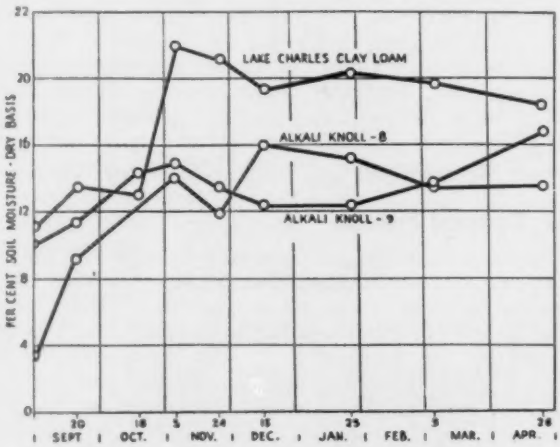


Fig. 2. Field Seasonal Soil-Moisture Variation.

temperature of soils at the depth of even the shallowest mains is comparatively small, considering the variations at or above the surface. However, if local conditions indicate the possibility of temperature being a factor, laboratory tests could easily and quickly be made which would indicate the extent of corrosion rate variation from that particular factor. Both the rate of corrosion and the electrical resistance of soils varies with temperature, the resistance increasing approximately 2% per degree centigrade. Readings of electrical apparatus, therefore, may require correction for any major differences.

Effect of Texture

Another factor, although not often a vital one, to be considered in the survey of soils by electrical methods is the soil texture. Determination of the particle sizes

[1] "Soils Moisture Survey Procedure and Summary of Results" by Guy Corfield, O. L. Wresler and R. C. Terradell given at the Bureau of Standards Underground Corrosion Conference, March, 1933.
[2] "Cause of Corrosion in Alkali-Knoll Soils" by Walter F. Rogers. Proceedings of 15th Annual Meeting of American Petroleum Institute.

and the quantity of colloids, and comparison of the percentages thus found with those of other soils in which the rate of corrosion is known, has been found advantageous. An indirect and simpler method of ascertaining the importance of density, is to determine the permeability. Both of these methods fundamentally recognize the importance of the voids in soil which may be filled with moisture or oxygen, both primary factors in corrosion. The relationship of permeability, density, or voids, relative to the rate of corrosion, has been previously discussed, but at this time interest is centered particularly in the effect of these characteristics on the conductivity of a soil. Ordinarily the conductivity of a soil will increase with its density. Laboratory tests may be easily conducted to determine the variations of conductivity with varying densities, and the knowledge thus obtained be used to explain possible differences in the rates of corrosion. This consideration is particularly important when the readings found on the electrical measuring devices in a single soil type remains practically constant, but considerable variation occurs in the rate of corrosion. Variations of this nature also indicate the desirability of spot checking the electrical resistances found in the field by laboratory tests, to determine the rate of corrosion. When density is a factor, the inaccuracy of direct predictions from electrical measurements is not usually altered by conducting the field survey when the soil is saturated, or by determining the maximum point of corrosion in the laboratory by electrical methods only. The consideration of density, permeability or voids, when considering electrical survey methods, only applies to those soils which are not in the category of sand, gravel, mixtures of these two, or similar soils which definitely lack the ability to retain moisture. Electrical measurements in such soils can not be relied upon for the prediction of corrosion, and actual measurement of the density, or other physical characteristics, would not provide any indication of the reason for the electrical measurements not being indicative. However, in other classes of soils which may be classified as well drained, the texture is of vital importance, especially when the electrical survey may indicate a lack of need for protection.

[3] "Accomplishments in Determining Soil Corrosiveness" by Scott Ewing, A.G.A. Research Associate, U. S. Bureau of Standards presented to the 9th Annual Distribution Conference of the A.G.A.

[4] "A Practical Soil Corrosion Survey with the Shepard Soil Resistivity Rods" by A. V. Smith, The U.G.I. Co., Philadelphia, Pa., presented at the 1932 Annual Convention of the A.G.A.

Effect of Soluble Material

It has been mentioned that resistance of soil is affected by the quantity and composition of the soluble material present. The relationship, however, is both variable and inconsistent in both the same and different soil types. Two soils having the same quantity of soluble material present, and which have been classified as belonging to the same type, may have entirely different resistances and rates of corrosion, the cause of which may sometimes be traced to the previously mentioned factor of texture. Again the actual rates of corrosion are advantageously ascertained wherever the electrical survey indicates a relatively non-corrosive soil.

Attempting to ascertain the relationship between the quantity and composition of the soluble materials present, and the rates of corrosion, is frequently difficult and confusing, and is important only when the more broadly applicable method of electrical measurements indicates a non-corrosive soil and additional assurance is desired to confirm the findings. This is one of the reasons why a strictly chemical analysis of a soil is not as valuable for corrosion prediction as a combination of the various methods.

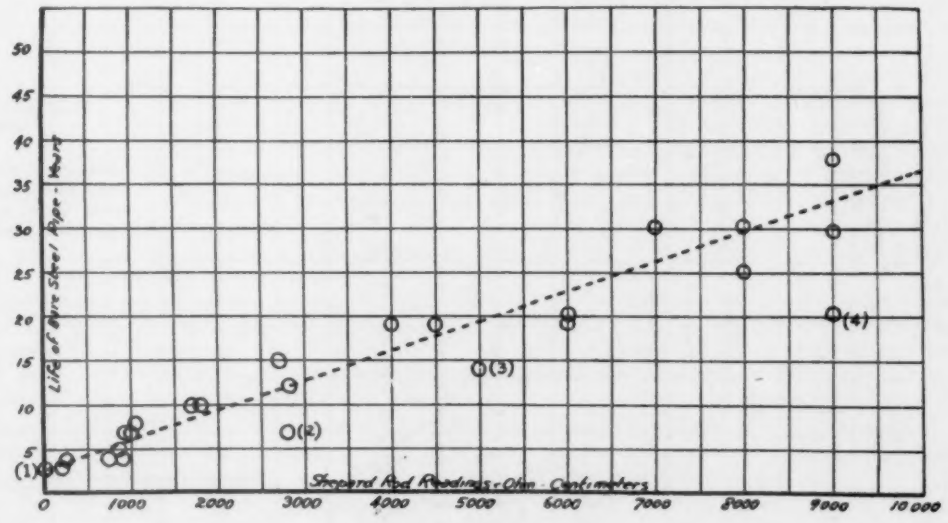


Fig. 3. Shepard Rod Readings in Soils of Known Pipe Life. Southern Counties Gas Co., California.

Interpretation of Resistance Values

The resistance of a soil may be indicative not only of the rate of corrosion due to inherent characteristics of the soil, but may also indicate the locations where any stray currents collected by a buried structure will probably discharge into the soil, as in such areas stray currents will find less resistance to leaving the pipe. Also in any areas where there is a rapid decline in the electrical resistance of the soil from immediately adjoining sections, conditions would probably be favorable for the discharge of stray currents.

It has been suggested by A. V. Smith[4] that sudden drops or abrupt changes in soil resistances may be of more significance in indicating locations of more rapid rates of corrosion than large areas of low resistances. From his observations Smith contends that the above conclusion is true in both acid and alkali soils.

Correlation of Resistance and Rate of Corrosion

The number of items affecting electrical measurements may cast doubt upon the value of the method for predicting rates of corrosion. Vast quantities of

field measurements have been made, and indicate the electrical measurement methods to have the widest application of any and to be the simplest in application. Figure 3 plotted by Ewing[3] indicates results of surveys made in California by Mr. A. B. Allyne. This curve indicates a particularly close correlation between resistivity and life, and is representative of some localities. The variations ordinarily found are of a greater magnitude than those from Allyne's observations, as indicated by Figure 4 also plotted by Ewing[3] from the works of Charles Fitzgerald on lines existing in Texas. However, even Figure 4 with its greater variations, not materially alter a decision on the determination of protection to be used, as in the particular soils represented, protection would ordinarily be applied on all sections from 0 to 1000 ohms per cubic centimeter, whether the average life as represented by the curve of approximately 50 years, or the minimum of 9 years life were taken. With an average life of 50 years, the considerable number of leaks between the initial penetration occurring at the age of 9 years and 50 years, would be desirably avoided, or at least materially minimized by a decision to use protection.

Many other studies could be included confirming the

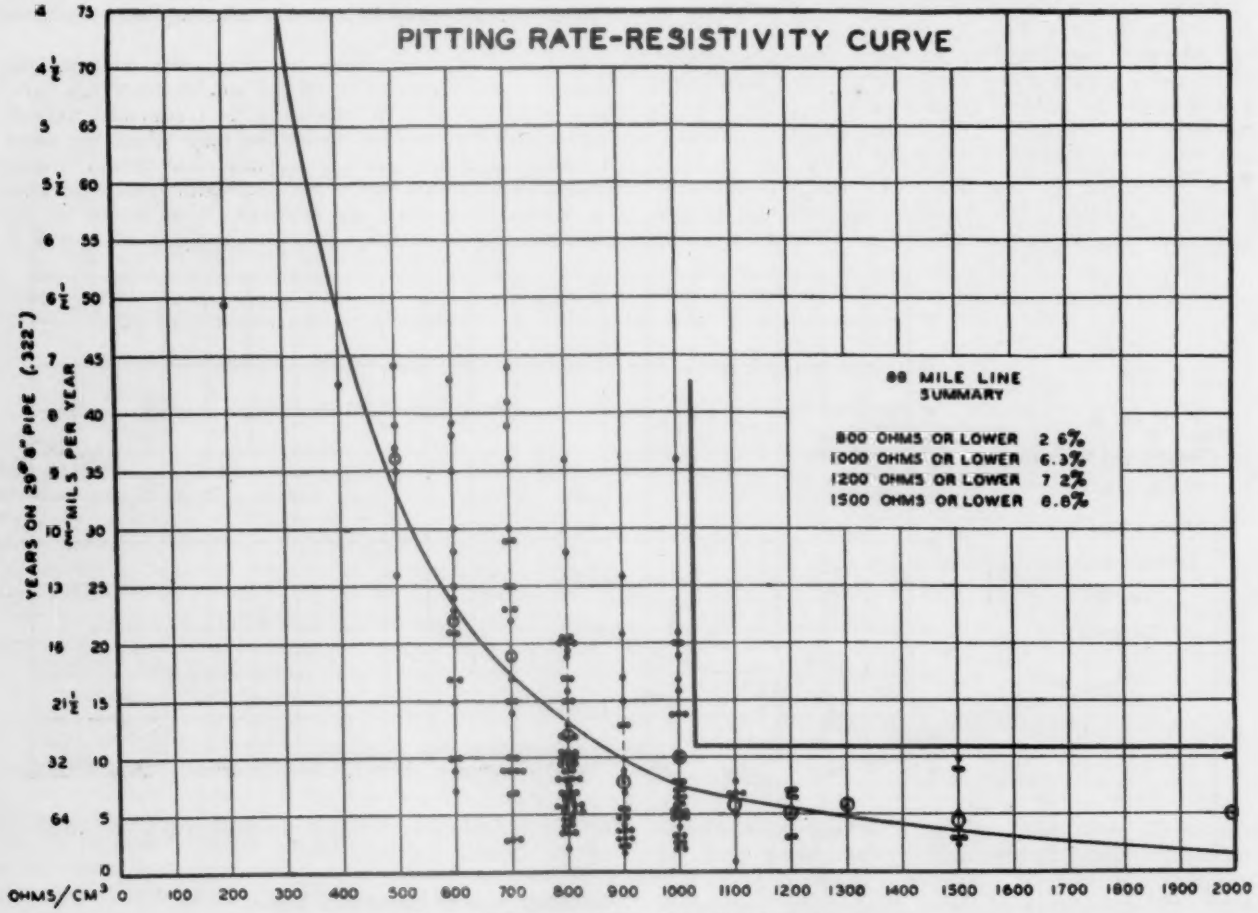

PITTING RATE-RESISTIVITY CURVE
YEARS ON 20# 8" PIPE (.322")
PENETRATION IN MILS PER YEAR
OHMS/CM³
88 MILE LINE SUMMARY
800 OHMS OR LOWER 2.6%
1000 OHMS OR LOWER 6.3%
1200 OHMS OR LOWER 7.2%
1500 OHMS OR LOWER 8.8%

Fig. 4. Fitzgerald's Pitting Rate—Resistivity Curve.

indicates the value of the survey as up to and including 1000 ohms per cubic centimeter, the average life of the pipe would ordinarily warrant protection regardless of the considerable variations, while above that value, decision as to policy would not be difficult were the readings shown actually on soils in new territories, as the differences in resistance values for known periods of life had materially lessened, and thus the value of the readings for prediction improved. The curve does emphasize the previously mentioned observation that more is known of the correlation between electrical characteristics of a soil and rates of corrosion where pipe life does not exceed 30 to 40 years, than where pipe life exceeds that period, and also again raises the question, is 30 to 40 years, or even 50 years sufficient life in permanently established utilities. Figure 4 also indicates the reasonableness of the conclusion that, taking the lowest rather than average resistances found in any group as the basis for corrosion rate prediction, would conclusions as to the correlation between electrical measurements and rates of corrosion indicated by Figures 3 and 4, but repetition would not materially alter the conclusions. Difficulty is much more prevalent in reaching a decision as to what may be considered a desirable average life, than in determining by means of survey and laboratory methods what the expected life of bare pipe in a soil will be.

Electrical resistance soil surveys are proving valuable in a variety of conditions, but as a general conclusion it may be said they are relatively more indicative in arid and semi-arid regions than in the more humid regions, where acidity may prove a more accurate criterion.

Significance of Resistivity Value

The resistivities found must be interpreted in terms

(Continued on page 58)

REFRACTORIES For Water-Gas Machines*

By Charles H. Hughes
Research Division, Semet-Solvay Engineering Corporation

The demand for improved or super refractories which started fifteen years ago in the water-gas division of the manufactured-gas industry is now increasing in intensity. Many brands of refractories successfully developed for other industries are now recommended to replace firebrick in water-gas machines, mainly because the physical characteristics of the specialized refractories indicate that their properties have particular application in these operations.

In addition to using standard firebrick in the construction of water-gas machines, we have had experience with the use of silicon-carbide, mullite, high alumina, diaspore, kaolin, sillimanite, plastic and hydraulic refractories hot-patch materials, protective coatings, various mixtures used in the manufacture of unusual shapes such as tile and special checkers, high-temperature-insulating firebrick, and hydraulic-insulating materials.

It has also been our privilege to observe experiments conducted by the various operating companies with improved refractories.

Unfortunately, it is most difficult to write specifications to cover accurately the actual operating conditions in a water-gas generator that will convey sufficient information to the refractories manufacturer to enable him to produce the proper refractory.

With a full knowledge of the operating conditions in each gas plant, we still find it necessary, with the assistance of ceramically trained men in the employ of the refractories manufacturer, to follow the trial-and-error method of selecting refractory materials. In relating some of our experiences with the various materials, we have omitted reference to company brands.

Silicon-Carbide Refractories

Silicon-carbide is a product of the electric furnace, produced by the chemical reaction between coke and silica sand at a temperature of 3350° F. This crystalline substance, silicon-carbide, does not melt at any temperature up to its decomposition point, which is 4064° F.

A silicon-carbide refractory is composed of crystals of silicon-carbide held together by a small percentage of highly refractory bonding clay, or other bonds.

The properties of silicon-carbide refractories are as follows:

1. High heat conductivity.
2. Hot strength under load.
3. High refractoriness; does not soften or fuse.
4. The inherent hardness and close-grained structure of the bonded refractory makes it highly resistant to abrasion or infiltration of slags.
5. Clinkers can be easily removed without damage to the refractory.
6. It is not affected by the ash from coals having a low iron content.
7. Low permeability to gases.
8. High heat storage when properly insulated.
9. Non-spalling. The principal reason why these refractories are more resistant to spalling is because of the high heat conductivity, changes in surface temperatures being quickly conducted to the whole brick, thus preventing surface stresses. The two properties which complicate its use for generator linings are rapid heat conductivity and growth of the material. All silicon-carbide refractories increase in size due to oxidation which changes the structure of the brick.

During the early development of silicon-carbide refractories for water-gas-generator linings, we observed the performance of the material in two blue-gas generators. The machines were to be operated continuously for twenty-two hours, using by-product coke as fuel.

One of the blue-gas generators was lined with a solid lining of silicon-carbide. The manufacturer was quite certain that, since the coefficient of expansion was low, it would not be necessary to provide for much expansion of the material. Block insulation was used between the shell and the refractory.

In a very short time, the growth of the material, due to oxidation, sheared the rivets in the vertical and horizontal seams in the generator shell. Repairs were made and the lining gave about 6000 hours of service.

A ventilated lining of silicon-carbide was installed in the other generator. The intermittent heating and air cooling of the lining was the cause of some spalling and considerable patching. The lining remained in the generator until the plant was shut down. The service record was about 6000 hours.

During the past five years, we have sent operators to plants using ventilated, silicon-carbide linings for the purpose of improving the operating results. By changing the size of many openings and plugging others, the make was increased with better fuel and oil results.

We have used solid, silicon-carbide linings in two six-foot, blue-gas machines in which oxygen, in place of air, was used for blasting. The fuel used was coal and coke.

In our latest operation conducted in Canada last winter, we used 100% electrolytic oxygen. The renewable generator lining was of solid silicon-carbide 4½" thick backed up with a super-insulating brick 1¼" thick, an outer lining of firebrick 4½" thick with ½" fibrous insulation between the firebrick and steel shell.

The surface temperature of the shell was the same as in standard, water-gas machines. The fused clinker did not stick to the lining. There was no evidence of spalling. The lining appeared perfect after six weeks of test runs, using as fuel, peat, coal, by-product coke, and mixture thereof.

For actual operating results with silicon-carbide linings, I urge you to read "The Economics of Silicon-Carbide and Clay for Generator Lin-

**Delivered at a meeting of the Operating Division of the New England Gas Association, October 2nd, 1936, at Hartford, Conn.*

ings," by Herbert C. Jones of the New England Power Engineering Service Corporation. This paper was presented before this Operating Division a few months ago.

Mullite Refractories

The next super-refractory investigated was mullite, a super-refractory obtained by calcining or firing one of the sillimanite group of three anhydrous aluminum silicates; kyanite, andalusite, or sillimanite. It is also made by subjecting other alumina-silica minerals to high-firing temperatures.

Mullite takes its name from the Island of Mull off the coast of Scotland. It is an igneous island where some years ago mullite was found naturally formed. Workable deposits of anhydrous alumina-silicates have been found in various parts of the world. Some of the principal deposits are: andalusite in California; kyanite in California, Virginia, North Carolna, and India; and sillimanite in India.

The following properties are claimed for refractories made of this material:

1. A high softening point.
2. Low coefficient of expansion.
3. Low coefficient of contraction.
4. Good resistance to thermal shock or low spalling tendency.
5. Imperviousness to slag erosion.
6. High temperature of vitrification.
7. Ample load bearing capacity.
8. Chemical neutrality.
9. It may be used in either a reducing or oxidizing atmosphere.

Mullite brick gives best service when used in melting furnaces for non-ferrous metals, glass, and for pottery and porcelain kilns. It is not recommended where it will come in contact with slags of high iron content.

We agreed with the ceramic engineer that this material came very close to being suitable for the removable liner block in a water-gas machine.

In the year 1928, we experimented with brick made from 75% mullite imported from India. A section of the removable firebrick lining, four feet square in and above, the clinker zone, was replaced with mullite. The fuel used was coke.

The brick in the clinker zone resisted the spalling action of the water used for rotting the clinker. The fused ash penetrated the pores of the brick less easily than in first quality firebrick. The material appeared promising. Later the mullite bricks in the clinker zone were replaced by bricks made with a lower percentage of mullite. The grain size was selected with a correspondingly lower percentage of open pores. There was less spalling and slag penetration. I inspected the lining seven months later. All of the bricks above the clinker zone were in place. The ends of the brick, which were slightly spalled, extended about two inches beyond the surface of the adjoining firebrick. The bottom liners to a height of three feet had been renewed with fireclay brick.

Our interest in this material was again aroused when, three years ago, a manufacturer placed on the market a material presumed to contain a high percentage of mullite. It developed that this brick contained a much smaller percentage of mullite than those used with the first test. The material was advertised as non-spalling, non-shrinking, and resistant to slag action. The salesmen furnished proof the material was giving excellent service in three water-gas generators in which heavy oil was being reformed. On our recommendation, a lining, using 4½ in. circle brick, was installed by one of our customers who had reported an excessively hot generator when using heavy oil with a firebrick generator lining. We were later informed by the salesman that all of these linings were replaced with fireclay brick. The manufacturer promised to make liner blocks to fit generators providing there was a demand for this material. A further investigation of this material has been promised.

High-Alumina Refractories

A high-alumina refractory is defined as a material containing 50% or more of alumina and made wholly or in part, from one of the alumina materials: diaspore, bauxite, gibbsite, kyanite, sillimanite, andalusite or others; or fused alumina (artificial corundum).

Our experience with 70% alumina brick in water-gas machines has not proved satisfactory, due entirely to excessive shrinkage and slag penetration. On one contract, the gas engineer for the customer specified high-alumina liner blocks containing not less than 70% alumina. We had previously used high-alumina brick in the construction of a special furnace. The brick failed due to surface shrinkage.

Our experience was discounted and high alumina was used in the construction of several removable generator linings. The salesman assured the gas engineer the brick would not shrink as the material had been precalcined. The first time each generator was clinkered, the entire surface of the liner blocks, over certain areas, came out with the clinker. In a very short time, the entire surface of all the liner blocks had spalled off to the depth of one inch. Excessive surface shrinkage and slag infiltration was the cause of the failure. All of the liner blocks were replaced with firebrick.

We have been informed by the ceramic engineer for the refractories company that high-alumina brick now being sold under the same brands will not shrink. He explains that the crystalline inversions, accomplished by the improved process of manufacture, such as selected grain sizing and precalcinating the material at higher temperatures, account of its negligible shrinkage at the highest operating temperatures. Penetration of slags is reduced to a minimum due to the close texture of the brick. We are pleased to learn from the reading of Mr. Jones' paper that his organization has been using high-alumina brick in a generator since 1934 and such good results as to justify continued experimentation. It is our purpose again to experiment with high-alumina brick starting with the 60% alumina class.

Diaspore Refractories

Diaspore is a fireclay with an unusually high (70-80) percent alumina content after calcination and free from injurious fluxes.

Our early experience with diaspore materials was expensive, due entirely to excessive shrinkage. The physical properties of improved diaspore refractories are: permanence of volume (non-shrinking), resistance to load under heat, and resistance to spalling.

Three years ago, we designed and operated a plant for the production of a hydrogen-free gas of the following analysis: CO_2, 2.1% by volume; O_2, 0.0% by volume; CO, 31.3% by volume; N_2, 66.6% by volume.

The generator, which was furnished by the purchaser, was part of their laboratory equipment. The generator was lined with diaspore brick in the 60% alumina class.

I, personally, operated the set and know that the heat in the generator was excessively high. We expected to have clinker troubles. After each operating period, 90% of the hard-fused ash was resting on the tile used for grates, the other 10% was easily removed from the surface of the lining. There was no indication of shrinkage, spalling, or slag penetra-

tion. With standard water-gas operation, this might not have been the case. Recently four courses of liner blocks of this material were laid around the clinker zone in a large generator in the New York metropolitan district. The test will be severe, as the fuel is coke, and it is the practice in this plant to use water to rot the clinker.

Kaolin Refractories

Kaolinite is a mineral consisting, theoretically of 39.8% alumina, 46.3% silica, and 13.9% combined water. It is the principal constituent of most fireclays.

Kaolin is a white residual clay formed from a rock rich in feldspar. The white sedimentary clays found in the South Atlantic states are usually called kaolins.

Improved kaolin bricks are highly refractory, have a low coefficient of expansion and contraction, and are highly resistant to the corrosive action of oil slags. We use kaolin brick in the construction of ignition arches.

Sillimanite Refractories

Sillimanite refractories combine to a high degree all of the desirable features of various refractory materials now in the market. They possess the necessary hot strength required of a super-refractory, without the spalling tendencies; considerable higher refractoriness than high-duty firebrick, without the softening and vitrifying properties of the latter; inertness in a furnace atmosphere which will cause destruction of silicon-carbide by oxidation; and the chemical properties of diasport refractories at high temperatures.

The composition of a brick which we tested was approximately 65% alumina and 35% silica, combined in the shape of sillimanite crystals. The brick was not affected by an oxidizing or reducing atmosphere at any furnace temperature and was resistant to spalling due to its low thermal expansion and the absence of vitrification or shrinkage.

We have not used sillimanite refractories in a water-gas generator, but have tested its use around the oil burners in the heating flues of horizontal ovens. The burners were in continuous operation and the average temperature in the flues was 2750°F.

A small quantity of the oil was sprayed over the surface of the brick. At the end of three months, the refractories were honeycombed; the bonding clay had disappeared; the bricks were not under load and retained their structure due to the interlocking crystals. No refractory is stronger than the bonding materials.

Plastic Refractories

Refractory materials that are tamped or rammed into place in a wall so as to form a jointless monolithic structure are classified as "plastic firebrick." The properties of plastic materials which appeared suitable for generator linings were low-heat capacity, surface vitrification, and a jointless structure that might prevent slag penetration and improve clinkering conditions. We are using plastic materials successfully in other branches of the manufactured-gas industry. Our tests with plastic materials* in generators, over a period of ten years, have not produced a material equal to fireclay brick. We experimented with patches in and above the clinker zone. The largest patch, 6" thick, covered an area six feet square in the clinker zone, and five feet square above the clinker zone. The entire surface of the plastic material became vitrified to a depth of ½".

Slight spalling of the material occurred over a thirty-day period, when using coal and no water to rot the clinker. We then changed to coke. Clinkers formed as usual and, when water was used for rotting the clinker, all of the vitrified surface spalled off. The body of the material was underburned and friable. The patch was replaced with firebrick after a trial run of sixty days.

We have seen plastic materials used in walls to divide a fuel bed. Fire applied to both sides of the wall burned the material properly. Both surfaces were very hard and apparently vitrified to a considerable depth. We have seen charging holes and sections of generator domes constructed of these materials. The materials were giving good service.

We have received permission from Charles W. Taggart, General Manager of the city of Norwich (Connecticut) Gas and Electrical Department, to report the length of service and present condition to the plastic linings installed in the generator, carburetor, and superheater of one of their water-gas machines. A one-inch-thick, high-pressure, insulating block was used between the plastic lining and the shell.

The set with plastic lining was operated for 6,336 hours from March 30 to December 18, 1934. Four shut-downs were made for inspection and no repairs were found necessary. The set was again started on September 4, 1935, and remained under fire for 4,464 hours until March 7, 1936, without any shut-down for inspection. In the total of 10,800 hours under fire, without any maintenance to the lining, the actual number of hours in which gas was made was 5,138. The fuel used throughout this period was Boone Chilton coal. The set was clinkered every day. I was present during the clinkering on September 3. There was plenty of hard clinker on the grate with some sticking to the walls. The clinker crew did not always use water to rot the clinker, although they said a small amount was occasionally used.

The surface of the plastic lining in the clinker zone was rough and appeared to be a mixture of plastic and clinkers. The wall thickness was uniform. The surface of the plastic in the fuel zone and dome was slightly spalled. From all appearances, the lining should double its present record.

The same brand of plastic was used to line a larger generator in which coke was burned. Water was used to rot the clinker. This plastic lining failed in the clinker zone and has been replaced with renewable firebrick lining. These two installations check our experience with plastic linings. This same brand was used in the construction of a division wall in a generator. The material fell into the fire bed in chunks. The salesman reported that the cause of the failure was due to the use of frozen plastic. The wall was rebuilt with a new supply of the same brand and is giving good service.

Hydraulic Refractories

This type of refractory is mixed and handled like concrete. The properties are: extremely high, cold set; does not require heat, but hardens by crystallization; does not shrink during hardening period, total shrinkage to 2500° F. is 1.8%; withstands operating temperatures up to 3000° F.; low coefficient of expansion; highly resistant to slag action; low coefficient of heat transfer; withstands heating and cooling without deterioration.

We are using a brand of hydraulic refractories successfully in other industries. Our experience with this material in water-gas machines has been limited. Patches of the ma-

** If you are considering the use of plastic refractories, we recommend that you read the following: "Plastic Refractories" by Stuart M. Phelps, American Refractories Institute, Technologic Paper No. 3.*

terial used in domes of generators and in the carburetor indicate that its stands up as well as firebrick. The salesman informed us that the material is now being used to line angle connections.

We have information in regard to the lining of a small generator with another brand of hydraulic refractory. The lining of the carburetor is resurfaced with the same material. The fuel is anthracite coal. The lining is reported in good condition after a service record of three years.

Hot-Patch Materials

Hot-patch materials are sold for the purpose of making emergency repairs to refractory materials in service under furnace temperature conditions. Properties usually claimed for this material are: they adhere to spalled surfaces; are quick setting; have high refractoriness; and do not shrink or spall. We have tried many hot-patch materials on hot surfaces without any measure of success. Most hot-patch materials are made from finely ground, super-refractory materials mixed with a low-fusion-point clay or silicate of soda. The principal reason for the failure of such refractories is that it is impossible to clean the surfaces of the hot wall properly, or shape the opening that is to be repaired, to give the material a base to rest upon. The water or chemical used in the plastic will blow when it comes in contact with the hot surface. It then evaporates and the material shrinks, with the result that such repairs are temporary.

We have used hot-patch materials to repair cold walls very successfully. Certain hot-patch materials sprayed from mud guns in thin layers over hot surfaces give good results. It would be rather difficult to use mud guns for hot patching a water-gas machine.

Protective Coatings

We have searched faithfully for a protective coating which, when applied to the surface of a generator or carburetor, would fuse to the surface of the refractory and form a highly glazed, continuous, smooth and jointless surface, not only to protect the linings, but to prevent slag penetration in the generator and oil penetration into the walls of the carburetor.

Our first effort to solve the clinker problem in a water-gas generator was with the use of soda ash to lower the fusion temperature of the ash in the coke. The result was a glazed surface of the brickwork in the generator dome, angle connection, walls, and checkers in the carburetor. The glaze was about 1/16" thick. Over a period of ten days, the oil increased from 2.86 to 3.2 gallons per MCF. during shutdown periods, the glazed surface of the checkers crazed and shelled off. Oil carbon and blown-over fuel accumulated over the surface of the checkers. The carburetor was recheckered and the oil results improved.

On Friday, September 4, 1936, I attended a meeting at Bedford Springs, Penn., of the Refractories Division of the American Ceramic Society. From a paper by J. D. Keller, Research Engineer, Carnegie Institute of Technology, on the subject, "The Influence of Material Shape and Size of Checker-brick on Regenerator Performance," I learned why the oil results were bad when using glazed checkers. The part that interests us most is that repeated experiments with smooth-checker surfaces prove that there is not sufficient turbulence to remove the protective film of gases surrounding the checker to permit proper heat absorption, and the heat capacity of the checker is reduced. The size of the checker governs the time of reversal. Short heating periods require thin checkers with large, rough-surface areas. I refer you to an early paper by M. C. Booze on the subject of, "Heat Penetration in Refractories," American Refractories Institute, Technical Bulletin No. 19, January, 1928. Paragraph two, page two, reads as follows:

"It is theoretically possible to produce a surface on a refractory wall, either by coating or otherwise, which will resist the penetration of heat and produce a noticeable drop in the mean wall temperature. This resistance, however, will depend upon surface characteristics." This confirms Mr. Keller's views.

We believe that, if it were possible to obtain a coating or filler which would close the open pores in the surfaces of the generator and carburetor linings, the deposits of slag and carbon would be reduced.

This past year, we tried special coatings imported from Germany. Separate mixtures were used for coating fireclay brick, silica brick, and high-alumina brick. Each mixture was supposed to fill the surface pores in the refractory, and glaze the surface at specified temperatures. The properties which attracted our attention were that these coatings would expand and contract with the brick linings, thus preventing the usual crazing and shelling of the coating. Every surface coating that we have experimented with has failed because such coatings do not expand and contract with the brick.

We recently inspected coatings covering the brickwork in the fire boxes of several marine boilers. The coatings were not crazed after several hundred hours of service in oil-fired furnaces. We hope to be ready to recommend this material for trial in water-gas machines following our next inspection.

Special Checkers

The transfer of heat from the surface of a checker-brick to its interior takes place by conduction. The rate at which heat is stored up in the brick depends upon its thermal conductivity, density, diffusivity, and specific heat. It also depends upon the thickness of the brick and surface area, its shape, and specific dimensions.

We know from actual service in the regenerators of by-product coke ovens that a silica checker 2½" thick, heated to 95% saturation in an atmosphere of 1860° F., requires a time interval of 15 minutes. A standard fireclay brick 2½" thick, under the same conditions, requires a time interval of 21 minutes.

The same fireclay checker 2½" thick is used in the carburetor and superheater at an average temperature of approximately 1500° F. with a time interval for saturation of only 1¾ to 2 minutes. It appears obvious that a fireclay checkerbrick 9"x4½"x 2½" is not altogether suitable for water-gas operation. We have patented a checker which provides a uniform wall thickness of 1¼" and a uniform cross section of flues arranged to insure both the vertical and horizontal flow of the gases.

We can refer you to a customer in Pennsylvania who has three carburetors checkered with our thin-wall checker made of Missouri clays.

The first carburetor has been in service 10,000 hours, the second, 9,000, the third, 8,000, and the machines are still in service. We are now experimenting in your district with thin-wall checkers made from a different mixture of eastern clays.

The carburetor and superheater of the machine at Norwich, Conn., are both checkered with notched split firebricks 1¼" thick. At the end of 6,336 hours, these checkers were cleaned and replaced. The oil results indicate that the thin checkers are still in good condition at the present time.

(Continued on page 54)

GREATLY INCREASED COOKING CAPACITY

PLUS GREATLY REDUCED GAS CONSUMPTION

•

NOW POSSIBLE WITH

UNIFORM HEAT TOP

WITH TOP HEAT CONTROL

•

AN ADVANCED EXCLUSIVE MAGIC CHEF FEATURE

(Left) Magic Chef Heavy Duty Installation with Uniform Heat Tops at Fred Harvey Restaurants, Union Terminal, Cleveland, O.

● Greatly increased cooking capacity with less gas consumption, less equipment and less floor space are now available to the busy chef through the new Magic Chef Uniform Heat Top with Top Heat Control.

The Uniform Heat Top, specially designed as a fast top cooking area, provides accurate, uniform heat over every inch of the entire top cooking surface of the Magic Chef Heavy Duty gas range.

The Top Heat Control is simple, positive and accurate. Top burners light automatically when gas is turned on, then the graduated dial can be turned instantly to the desired degree of heat.

With their speed, economy, cooking capacity and flexibility, Magic Chef Heavy Duty ranges completely meet today's food service requirements. Write for details.

The contents of four large kettles can be cooked at the same time on one 32-inch unit at fast, medium or slow heat or at varied temperatures on each cooking plate, if desired. Four center fire ranges would be required to do the same amount of fast cooking in the same time.

The heat is positive and satisfactory because it is even *all over* the entire cooking surface while on center, front and side fire tops the heat is graduated unevenly from high to low temperatures.

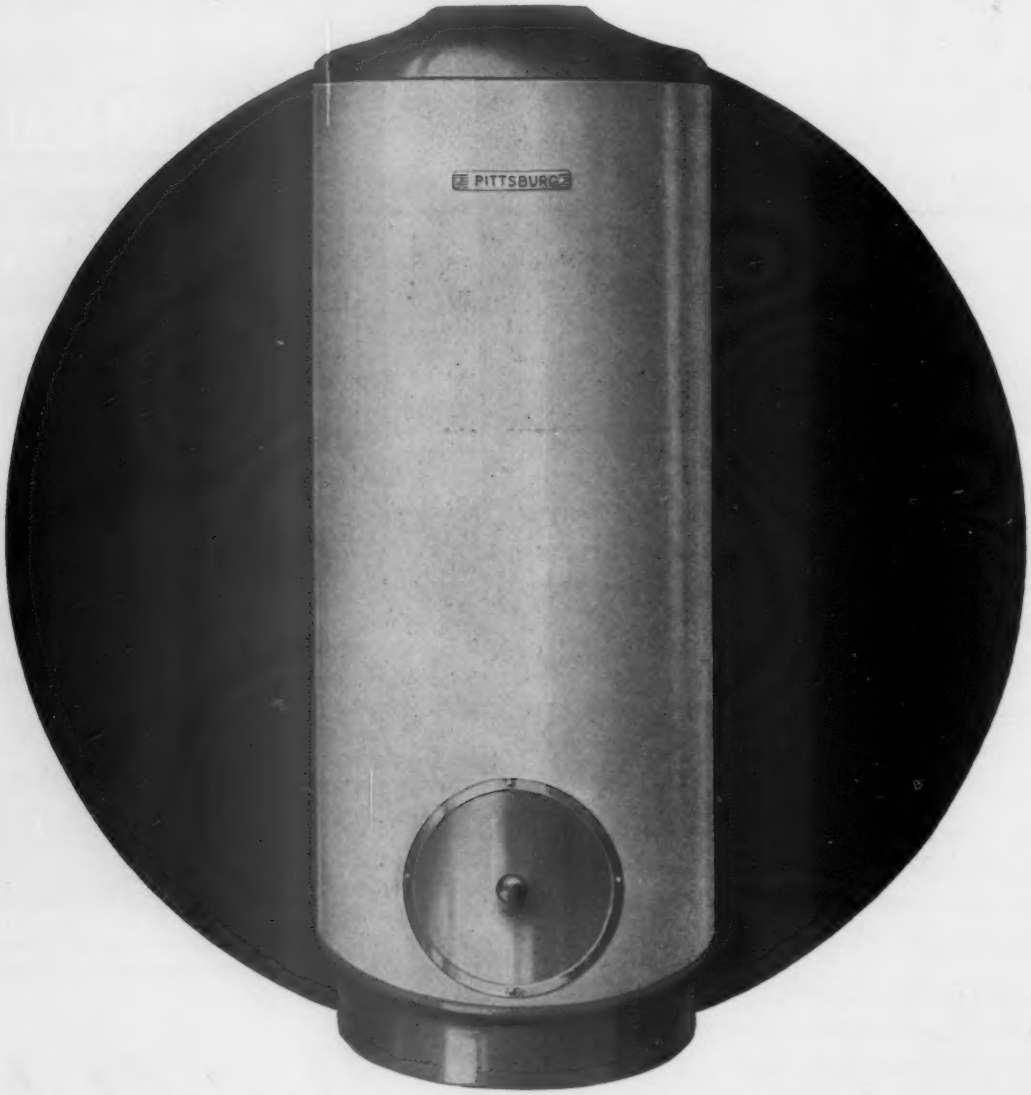
AMERICAN STOVE COMPANY
BOSTON • NEW YORK • ATLANTA • CLEVELAND • CHICAGO
ST. LOUIS • PHILADELPHIA • SAN FRANCISCO • LOS ANGELES

Magic Chef
AMERICAN STOVE COMPANY

LOOK FOR THE RED WHEEL WHEN YOU BUY A MAGIC CHEF

MAGIC CHEF HEAVY DUTY *Automatic Equipment* **FOR MODERN GAS COOKING**

Streamlined
PERFORMANCE AND STYLE



Modern design and new engineering features distinguish Pittsburg Automatic Gas Water Heaters for 1937.

BONDERIZED: with Pittsburg's rust-resisting process, long life is assured for all formed metal parts.

Pittsburg's *AIRTROL:* improves performance and increases economy. Shutting off incoming cold air when the burner is off, it keeps the water hot longer.

STREAMLINE Merchandising Plan: a modern practical selling plan that WORKS.

Discover the remarkable 1937 opportunity this heater holds for you. Send for a heater for inspection and test—and complete information on the line.

THE PITTSBURG WATER HEATER CORPORATION
PITTSBURGH, PENNSYLVANIA

How Commercial and Industrial Jobs Have Been Sold

by

HAROLD E. JANSEN

CONTINUING the plan of having dealer cooperative effort during every month of the year, the Empire-New York group of utilities in Central New York engaged in a Chill-Chaser Steeple Chase campaign featuring the sale of commercial and industrial gas space heating as well as domestic gas house heating from Aug. 17 to Nov. 21.

A year ago during a similar 71-day campaign in the cities and villages of Auburn, Cortland, Geneva, Ithaca, Newark, and Penn Yan, 101 commercial and industrial units were sold. These included 28 in Ithaca, a city of 21,000 pople; 21 in Geneva, with about 16,000 inhabitants; and 22 in Auburn, with a population of about 40,000. The cities are served by the New York State Electric and Gas Corp., the Empire Gas and Electric Corp., and the Central New York Electric Corp.

This campaign was followed during February and March of this year with another in which commercial gas cooking and baking equipment was featured. This resulted in an added load of 1,880 MCF. The commercial cooking, baking, and pantry equipment campaign was continued during April and May, with much better results than in the previous one. The properties exceeded their quotas by an average of 181.1 per cent, and a total of 4,058 MCF was added to the company's load.

Under the dealer-utility cooperation plan in force in the Empire-New York group for the past three years, the commercial or domestic salesman assists the dealers in contacting and selling prospects, and in surveying and analyzing their requirements. This dealer-cooperation plan has been explained in the February, 1935, issue of *The Journal*. Briefly, the utility salesman is compensated on the basis of the amount of load-building equipment sold in the territory by both the dealer and the utility. The utility salesman never tries to compete with the dealer, and gives him every opportunity to get the profit on the sale.

When natural gas was brought into the territory about three years ago and it was possible for the utility to lower its rates so that a gas rate comparable with coal could be provided for consumers, the New York State Electric and Gas Corporation, operating in Ithaca and Cortland territories could send out letters to prospects as follows:

"We are writing you this letter to acquaint you with the formation of our new Bakery, Hotel and Restaurant Department. This department will carry a complete line of kitchen equipment for all commercial consumers of gas.

"You are probably aware of the advantages of gas over other forms of fuel for clubs, hotels, and restaurant work. All of the larger hotels and restaurants have changed, or are changing, to the use of gas as a fuel for cooking. Gas, conservatively and efficiently used, and the installation of good equipment properly placed, is not more expensive than other fuels, and in addition, the convenience and cleanliness of gas fired kitchens cannot be estimated on an economic basis.

"Our Hotel, Bakery, and Restaurant Department will specify what we believe to be the best on the market today, both from the economical use of gas and rugged construction.

"Practically 90 per cent of the hotels and institutions today, including Cornell University, which does the majority of its cooking by gas, are using the same equipment we specify.

"We intend to give you a complete and satisfactory service on all our installations. This fact, plus our time payment plan which enables the boarding club to pay for the new equipment each month, has proved very successful with fraternity houses.

"We sincerely hope that you will take advantage of the opportunity offered by our Bakery, Hotel, and Restaurant Department to improve the efficiency of your kitchen."

David E. Cynoske, commercial salesman at Ithaca, N. Y., believes that the first requirement of successful selling of commercial gas heating equipment is to have a salesman for that work alone, and that it is advisable to have another to handle ranges, water heaters, etc. The salesman, he says, should be able to contact every commercial consumer at least once a year, and preferably oftener.

Direct Mail

The Empire-New York group of utilities believes in direct mail promotion as well as in having sufficient salesmen to cover the territory properly. Officials point out that one commercial salesman can sometimes handle a city of 35,000 inhabitants, but that each city has to be studied individually.

In space heating, the clothing business has been found to be highly receptive. Cleanliness of both store and merchandise is an important factor here. Also, the proprietor of a clothing store is usually not mechanically minded. He is a good haberdasher, but a poor furnace stoker.

Restaurants are always good prospects for space heating. One reason is that they are in the habit of using gas.

Small Store Prospects

Another good prospect is the small store which is independently heated. In some of the smaller retail places there are only two or three employes, and they don't like to have to go down stairs to take care of a coal fire. Furthermore, over week ends they don't have to come down to the store and empty ashes or see how the fire is going.

Intermittent heating jobs, such as in churches, halls, etc., are potential customers. Here there is economy of operation and also convenience, just as in the small retail places. The cost is on practically an even footing with coal in the Central New York cities of the Empire-New York group.

Most difficult has been the work in disposing of space heating in the larger buildings, where the cost differential is great. Buckwheat coal can be purchased at a price equivalent to about one-half the cost of gas. Zone Control has helped greatly in the sale of gas heating in these large commercial establishments. The various floors are heated by unit heaters.

A commercial salesman must know the field thoroughly, for there are many different types of equipment to be sold to meet the requirements of various places, and locations.

A complete survey should be made, taking into consideration the labor costs of heating by coal, the convenience of gas, the safety, cleanliness, and space saving. The fuel bin alone may be costing a lot in rent. Proposals on the larger jobs should be written out, the salesman evaluating each item outside of fuel costs which enters into the heating costs of the building.

In the sale of cooking equipment too the commercial salesman has his problems. However, the Empire-New York group has disposed of worth-while jobs in cooking, and heating water by gas.

The following direct mail letter was sent out:

"What can we do to curtail operating costs in our business?

"Today's vital question!

"In restaurants, hotels, and institutions there are several ways to stop waste and lower operation costs. For example, the new gas ranges with insulated ovens equipped with temperature controls will cut fuel costs from 20 to 40 per cent. On the basis of this saving the equipment would soon pay for itself. A replacement of this kind is good, sound business.

"Let us take a few more reasons why the new models can more than pay for the initial cost.

"(1) More uniform food can be cooked.

"(2) Roasting and baking food in an oven with temperature control is bound to produce better results and eliminate food spoilage.

"(3) Loss of shrinkage in food is greatly diminished due to positive and accurate temperature maintained.

"(4) A great deal of time can be saved for other work when the oven is thermostatically controlled.

"The advances in the past two years of new ideas in gas equipment are very great. Much time, money and first class engineering experience have been expanded in these new models to create greater efficiency and lower operating costs for the restaurant owner.

"Why not take advantage of the opportunity to make more money by investing in this new gas equipment which will pay for itself out of your savings?"

To keep the customers satisfied after they were sold, the utility sent out the following prescription on:

"How to Reduce Fuel Costs.

1. Turn on all burners for 15 minutes.
2. Turn off every other burner after 15 minutes.
3. Place pots on one range or one side if possible.
4. Avoid using two ranges when one will do.
5. When top is hot and kettles are boiling, turn gas down.
6. Do not tamper with burner adjustment—call the gas company, if you are not satisfied.
7. Fuel can be saved by turning down the burners just as you shift your car from low to high.
8. Crowding pots on one range will not prevent boiling—it will give more economical cooking.
9. Ovens can be loaded—don't put one pan on two ovens—put two pans on one oven.
10. The gas company will clean and properly adjust your burners at your convenience—it is our duty to help and advise you."

Here are some actual instances in which equipment was sold. They show that convenience, cleanliness, saving in space and perhaps reliability of service are considered by the customer in addition to the all-important item of cost.

Case No. 1

A large restaurant was using a coal range that was 112 inches long. The proprietor was induced to install two gas ranges with broilers and griddles. They took up but 94½ inches of space, leaving room enough for the installation of another gas range if business increased.

The salesman had analyzed the customer's requirements and impressed upon him the fact that he was using too much coal for the amount of business the restaurant was doing. The proprietor's coal bills had been $55 to $60 per month, whereas after the installation of gas equipment they averaged $20 per month less.

The proprietor was so pleased that he gave the utility a letter of recommendation which could be used in contacting other prospects.

The salesman took the temperature of the kitchen at the time the coal ranges were in. He had promised that the kitchen would be considerably cooler if gas ranges were installed. When the temperature was taken following the installation of the gas equipment, it was discovered that there was a difference of 15 to 20 degrees.

Following the installation, a monthly check-up was made on the gas burners to make sure they were functioning properly and that the customer was getting the maximum efficiency from his equipment.

Case No. 2

A Cornell University fraternity house had been using a coal range. The salesman impressed upon the steward that there were no broiling facilities, and that there was the inconvenience of shoveling coal, emptying ashes, and the unsanitary condition of dust.

Letters and literature were sent to influential alumni. A number of them were contacted personally and "sold" on the benefits to be derived from a gas range.

The utility gave the fraternity the privilege of paying on a long-term basis of 30 months. From 10 to 20 per cent was paid down, the balance to be handled in equal monthly installments. The steward paid for the job out of a fund laid aside from the boarding club receipts.

Through similar arrangements made with other fraternity chapter houses, the utility was able to sell 22 new gas ranges in cooperation with dealers.

Case No. 3

Fraternities were contacted about heavy duty water heating. The commercial salesman stressed the convenience and cleanliness of heating water by gas—no ashes, no climbing the cellar stairs, instantaneous hot water 24 hours in the day.

The first heavy duty heater was put in on a 60-day trial. The house had been paying $16 per month for coal, and found that its gas bill was but $14.63 per month. The fraternity members were greatly pleased with the new setup, and gladly gave the dealer a written statement to that effect. As a result, five more fraternity houses were sold.

Not all of them secured the same economy of operation as the first house in which an installation was made. One Greek letter chapter found that its gas bill was $6 more per month than it had been for coal; while another that had been spending $17 for coal for heating its water discovered that its gas bill was $21.35. But in every instance the purchasers were satisfied, because of the convenience and better results obtained by gas heating.

Case No. 4

The proprietor of a large restaurant planned to make extensive alterations and improvements, including the installation of a bar. His desire was to make his place of business one of the most outstanding on the street. Dealer and company salesmen impressed the proprietor with the idea that his kitchen—although not in public view—should also be modern in every way.

The utility's commercial salesman, along with the dealer's representative, surveyed the kitchen's requirements, showing the proprietor how it would look with a new insulated range, water heater, and broiler. There was a considerable saving of space which appealed to the man, be-

cause of the small size of the kitchen.

The restaurant had been heated by coal, but the owner agreed to try gas heating. Also, it was decided to eliminate an antiquated gas range that he used for short-order work.

When the installations were made, the owner found that his bill for gas for cooking and hot water heating was about $10 a month more than he had previously been paying for coal.

There was a separate meter for restaurant heating. When the proprietor figured in $25 a month for firing over a 10-month period, he found that the cost of heating by coal and gas was about the same. He has never gone back to coal.

Case No. 5

A bakery formerly had one coal and two coke ovens, the latter for bread. The commercial salesman pointed out to the baker that he could turn out his baking faster by using two gas ovens for his pastry, since it is cooked at different temperatures. The maker therefore replaced the coal oven with two gas ovens.

These sales were not made, however, until after a coke oven had been replaced by a gas one. This installation had only been in six months when the proprietor was sold the other two. Now there are three gas and one coke oven in the bakery, and the prospects are that the latter oven will be replaced by gas in the near future.

Case No. 6

A small hotel kitchen was in need of new gas equipment. The dealer salesman and the utility's commercial representative took the proprietor to the largest hotel kitchen in the city, and also to the restaurant mentioned in Case No. 1. The owner of the small hotel had some idea of the equipment he needed, but the salesmen helped him to decide where he could place it in the kitchen to best advantage. He found that by installing new equipment he could keep it cleaner and more sanitary, and also have more room.

Case No. 7

In a small restaurant the proprietor worked in the kitchen. He was susceptible to the argument that his kitchen would be neater and better arranged by using gas equipment. Also, because he had to work there in the extreme heat provided by the coal stove, he was appreciative of the fact that gas would lower the temperature of the kitchen and make his work easier for him.

Case No. 8

A tinning company had been spending $800 per year for heating by coal. It was estimated that the cost of a night watchman and fireman for a 10 months' period was $800 more.

The tinners were induced to try room space heating. Their gas now costs approximately $1,700. Two unit heaters were installed. The cost is about $10 a month more than formerly paid for coal and the services of an attendant, but the added convenience apparently compensates for this small added cost.

Case No. 9

In the kitchen of one of the large girls' dormitories at Cornell University there was an old baking oven. The utility's commercial salesman promoted the idea of a new individual deck-control oven, with four tiers, permitting the baking of four different types of pastry at one time. Each tier had its own heat control gauge.

The utility company can counteract complaints about old coal or gas-burning equipment by keeping in close touch with the customer, and recommending new equipment where needed. One of the most frequent complaints heard, of course, is "bills are too high."

The salesman in charge of the bakery, hotel, and restaurant department calls on dissatisfied customers in that branch, and checks on complaints. One large hotel said that its gas bills were exorbitant. The utility representative went to the hotel kitchen, and spent considerable time with the chef to see if he was using the equipment properly and efficiently. It was found that the chef was coming to work in the morning and lighting up four burners in preparation for breakfast, when only two were necessary. The hotel management was pleased with the decrease in the amount of the gas bills.

The largest hotel in a city also complained about the amount it was paying for gas cooking. The utility representative made a survey of the equipment, and how it was being used by the chef. The salesman made the following report:

1. Found pastry cook regulates heat by opening doors and leaving burners on.

2. Chef leaves top burners on full when top is red hot.

3. Burners were left on when cooking was finished.

4. Biscuits left to warm on open oven door with burners on.

5. Broiler burners used 10 hours a day—toaster and directed heated grid would avoid this.

6. Ranges antiquated—new equipment needed, especially for pastry cook.

7. Instead of using two racks in oven, two ovens are used when one could do; the same with three instead of two.

8. Spuds were wide open, allowing as much gas as is possible to flow through them.

9. Menu is very profuse, making a great deal of cooking necessary to satisfy a small number of customers.

It was found that the chef was using the broiler to toast with. He was burning about the same amount of gas throughout the afternoon as during the normal peak, despite the fact that nothing was being served.

The utility representative returned to the hotel kitchen about three weeks after he had pointed out to the hotel manager and to the chef the many ways in which the bill for gas cooking could be cut. Here's what he wrote to the manager after making the final analysis:

"This letter should give you some knowledge of the work done in the kitchen of your hotel.

"On Oct. 26, 27, and 28 your daily average consumption of gas was 5,200 cubic feet. Since the educational work was done in your kitchen, the average from Oct. 28 to Nov. 18 was 4,097 cubic feet of gas. This shows a monthly saving of $30 or so. As you perhaps realize, this month's bill will be part of both these daily averages, so that your savings this month should be about $15.

"With this reduction as a substantial fact of our cooperation with you, we sincerely hope that you will allow us to make necessary changes in your equipment to further lower your bill and increase the efficiency of your kitchen."

By being interested in the hotel man's equipment and the reason for the unusual bills, the dealer and the utility made a large sale of new cooking merchandise to him. Any man in business is interested in saving money, and one can usually find a ready audience when talking about new types of equipment.

The oil man and the new types of coal ranges offer competition with gas, but the salesman must go out and counteract them. The utility can never take any commercial load for granted. With the oil and the coal man selling equipment, and the electrical dealer merchandising appliances, the commercial gas man has to hustle to get business. Two of the most important things to remember are: (1) Give good service on equipment and (2) keep the customer sold on the idea that it is the best on the market.

A Recapitulation of the Progress Made in Applying Summer Gas Air Conditioning to Industrial Plants

Charles W. Swenson

Consolidated Edison Company of New York, Inc., New York, N. Y.

FOR years, the gas industry has been meeting the various problems of drying and processing by the use of well designed gas appliances. In most cases, the processing was such that the circulation of *heated* air, automatically controlled was sufficient.

There are, however, some drying processes, which cannot be met by the usual warm air appliances because *low temperatures* as well as *low humidities* are required for their most favorable performance. In such processes, the temperature must be kept constantly at a relatively low figure to prevent physical or chemical changes which might result in injury to the product. This is especially true in the handling of hygroscopic materials, such as paper, film, chemicals, drugs, etc., where the relative humidity and temperature have a marked influence on the rate of production, general quality and appearance of the product. It is most important that the moisture content of the air be maintained at a figure favorable to rapid and satisfactory processing, thus keeping losses at a minimum. With this uniform condition, independent of the outside atmospheric elements, high speed machinery can be adjusted for maximum production with a minimum of delay, spoilage and defective products.

To meet this problems of indoor atmosphere control, the gas industry has designed special drying machines, namely, the gas-operated dehumidifiers. There are at least three such gas-operated dehumidifiers now being produced commercially. They are compact and operate efficiently with few moving parts.

These gas-operated dehumidifiers or low temperature drying units, are readily adaptable to a variety of process air conditioning applications. They work equally well attached to small drying cabinets or when conditioning for instance, a large printing plant. Control of the moisture content of the air is usually the major problem, cooling being incidental in most cases and handled by separate equipment, depending on the particular section of the country or other conditions that affect the climate.

Table 1 shows what are considered desirable humidities for different industries.

In industrial work, these gas dehumidifiers are almost always cheaper in first cost and in operating cost than systems dependent solely on refrigeration. This is partly true because in refrigeration, large volumes of air must be cooled below the temperature required or desired, in order to remove the moisture, and this added capacity and operating cost is usually a total waste in drying operations. Then too, these gas-operated dehumidifiers lend themselves easily to closer humidity control than any other system.

Because of these decided advantages, gas-operated equipment has a preferred field and warrants the most active support of the gas utilities. Industrial gas men especially will find many applications for this new load builder.

According to information furnished by the principal manufacturers of gas operated summer air conditioning equipment, up to the date of this paper, there have been installed throughout the country, units in the industries shown in Table 2 on the following page.

The total gas consumption derived from these process air conditioning installations is approximately 8,000,000 cu.ft. of 540 B.t.u. gas for the summer season.

This figure may not on the surface appear to be a very imposing one, but it must be remembered that this field is a new one and that we have only begun to go after this business. In totalling this gas consumption, we have assumed that the average installation will operate 1,000 hours at a 70% load factor.

The best and most numerous prospects are those in the printing and lithographing industries, the chemical and pharmaceutical industries, and those plants manufacturing lacquered parts. In these plants, dehumidifying is especially beneficial for the following reasons:

PRINTING—Prevents wavy edges and stretching of paper, eliminates poor register and cuts down on offsetting or smudging. Best condition varies from 45 to 55% relative humidity, the most important thing being the constancy of the relative humidity, rather than any definite figure.

TABLE NO. 1
DESIRABLE HUMIDITIES FOR INDUSTRY
Temperature Varies (75°-85° F.)

Industry	Process	Relative Humidity
Cellulose	Processing and Storage	35%
Confectionery	Hard candy making	40%
	Chewing gum rolling	50%
	Starch room	50%
Drugs	Powders and Tablets	30%
	Salts, Bromides and Seltzer tablets	25%
Electrical	Manufacturers of Electrical Windings	40%
	Storage of Electrical Goods	40%
	Insulation windings (104° F.)	5%
Foods	Preparation of Macaroni	38%
	Storage of Sugar, Gelatine	35%
Library or Museum	Book Storage or Paintings	40%
Paint	Air Drying Lacquers	40%
Paper	Storage and Processing	40%
Photographic	Film Drying	45%
Printing	Litho plate room (photo composing)	45%
	Press Rooms	55%
Rubber	Dipping Surgical Articles	30%

Presented at A. G. A. Industrial Gas Section—October 27, 1936.

TABLE NO. 2

INDUSTRIAL INSTALLATIONS

Table Showing Gas Heated Dehumidifier Installations Throughout the United States as Listed by the Principal Manufacturers

Industry	No. of Jobs Installed	Tonnage	Rated Gas Consumption, Therms/Hr.
1. Lithographing and Printing	5	33.5	11.10
2. Pharmaceutical (manufacturing tablets and effervescent salts)	9	25.0	8.30
3. Chemical and Testing Laboratories	7	20.0	6.50
4. Manufacturing lacquered parts	3	6.0	2.10
5. Shoe Manufacturing (leather drying)	1	2.0	.70
6. Manufacturing of safety glass (pyroxylin treated)	1	2.0	.70
7. Manufacturing of moulded cork	1	2.0	.70
8. Pencil Manufacturing (lead and crayon drying)	1	4.5	1.50
9. Roller engraving (Photo-engraving of copper textile printing rollers)	2	4.0	1.40
10. Museum and Library	1	4.5	1.50
11. Manufacturing of electrical parts (condensers)	3	16.0	5.60
12. Food Industry	2	4.0	1.40
13. Optical Goods	1	4.0	1.40
	37	127.5	42.90

LITHOGRAPHING—Needs 40 to 45% relative humidity in etching room, carbon printing and tissue rooms and sensitizing rooms. Two materials used in preparing zinc plates are gum arabic and dichromate solution, as well as the silver foil used in blocking out light. All of these are adversely affected by moisture.

DRUGS—Best condition between 20 and 35% relative humidity for tablet rooms and especially for effervescent salts.

LACQUER—Dehumidifying air going to spray booths and keep lacquer from "blushing." Best condition is below 45% relative humidity.

These gas-operated dehumidifiers have very definite sales advantages over other methods of process air conditioning.

Some of these are as follows:—

1. Entirely independent control of humidity and temperature.
2. More adaptable to closer control than any other system.
3. Lower operating and lower initial cost.*

Just a few words on some special sales aspects of gas dehumidification—in many instances, plants have had to shut down completely during certain days in the summer when the humidity was too high to carry on their manufacturing processes. This meant a lay-off for the employees during such days, and an interruption in the production with consequent loss to the plants and their customers. During the humid summer months with gas dehumidifying installed, these plants have been able to operate without interruption, with resultant continuous employment for the staff and increased output and profit for the plants.

The very great value of uninterrupted production and control of process conditions can hardly be overstressed. This feature is of great value to industrial plants—probably much greater than the industrial gas salesman himself may think. Another sales angle is that the satisfactory use of such process dehumidification equipment makes it possible for the industrial gas salesman to get more favorable consideration for other industrial gas appliances. This has in many cases resulted in sales of gas equipment not related to the dehumidfication process at all, but which sales might not have been otherwise obtained.

Still another important sales aspect of gas dehumidification is the short time required to write off the equipment costs. Usually, this period is very much shorter than that required for other machinery in the plant.

This new business of summer air conditioning is considered by many to be the coming industry, taking its place with the present day leaders. It is therefore, strongly recommended that the gas utilities conduct an aggressive campaign to get their full share of this new and coming business. If we organize now for this new load, it will most assuredly be a lot easier to get our proper portion of it. Considerable advertising should be placed in the trade magazines of those industries that need process air conditioning, such as, printing, lithographing, drugs, chemicals, etc.

As a result of a modest amount of advertising in New York City, much interest has been aroused in the use of gas dehumidifiers for process air conditioning. During May, June and July of 1936, six thousand prospective users of industrial air conditioning were mailed two separate pieces of literature

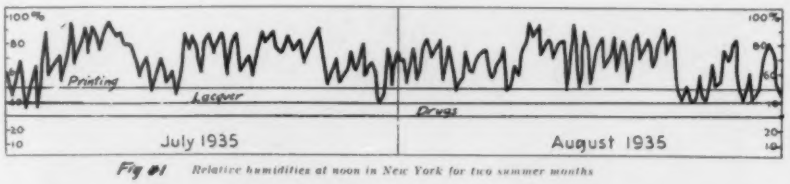


Figure 1. Straight lines show best condition for printing, lacquer and drug industries.

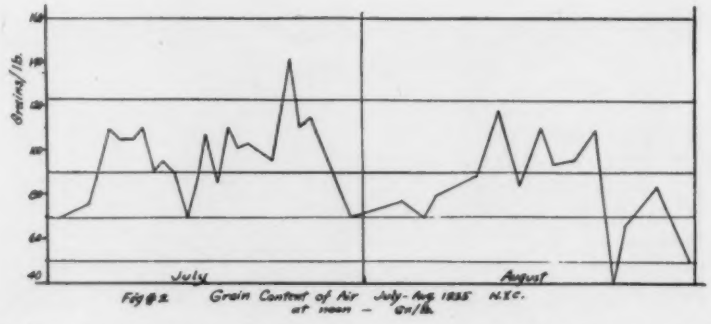
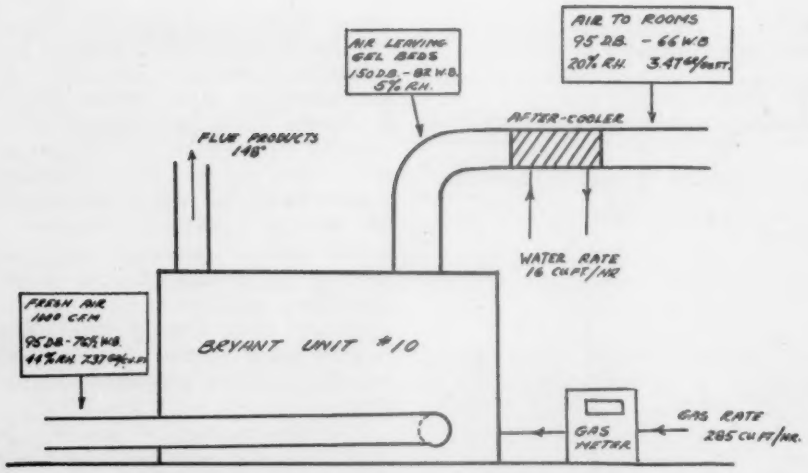


Figure 2. Grain content, showing if jobs are designed for 122 gr./lb. there are few days above that line and usually for only a few hours.

**The essential characteristic of any well designed refrigeration air conditioning system is that it must cool a large volume of air in order to remove the moisture and this added capacity and added operating burden is usually a total waste in drying problems.*



Typical test results with Bryant dehumidifier No. 10

As a result of these mailings and some straight canvassing, forty excellent leads were obtained.

Of these, seven jobs were actually sold and nine prospects are very active, of which at least three will be sold this year, the rest having promised to reconsider in the Spring. The remainder of the forty leads were either out-of-town installations, simple ventilating problems or the price of the installation was prohibitive for the benefits derived in their particular cases.

We now have a total of twelve gas operated process air conditioning installations in New York City, totaling approximately fifty tons of refrigeration and adding to our lines an estimated summer load of 3,000,000 cu.ft. of gas.

As a further aid to selling this gas operated dehumidifying equipment, it is worth noting that several leading refrigeration air conditioning manufacturers, as well as some leading air conditioning engineers, have recommended the gas operated dehumidifier as being best suited for certain industrial processes. Also, leading plants in many industries that require dehumidifiers, have already installed gas operated equipment. (Names of these can be had by writing to the American Gas Association.)

This new gas load was obtained through the part-time work of one industrial sales engineer and with the cooperation of the regular district industrial salesmen considerable help was also rendered by the equipment representatives as well as one of our company service engineers.

In our work in New York, we have found that the best months to obtain this business are from April through July, although equipment can be sold in all months of the year.

Many concerns decide to install equipment during the winter months so as to be ready for the humid weather that follows.

There is no doubt that we now have adequate, gas equipment for both process and comfort air conditioning. The market for process air conditioning is especially definite and wide in scope, there being absolutely no question but that gas operated dehumidifiers are best suited for this work.

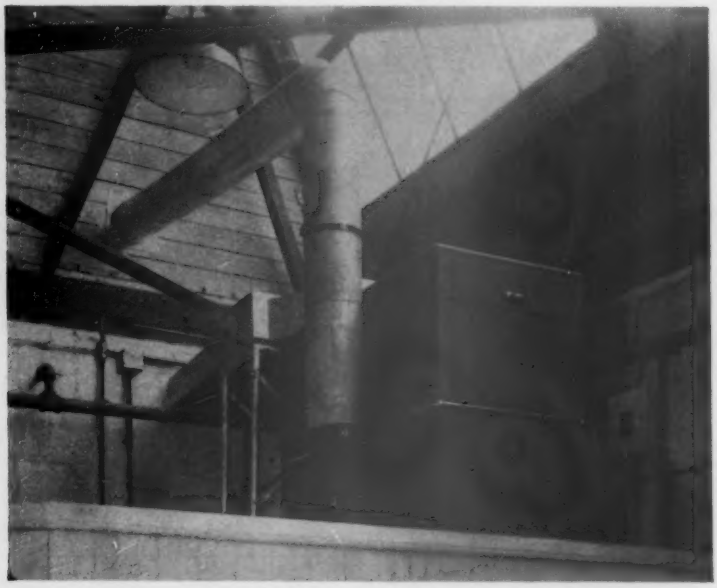
This attractive new load can be had if the executives of the many gas companies see the light and organize an aggressive promotional program. Experienced sales engineers, having a knowledge of air conditioning fundamentals and some practical industrial experience are best suited for this work.

Desirable Gas Load

Summer air conditioning is a very desirable gas load because:

1. Summer air conditioning is an off-peak load. (Only immediate prospect in most companies to smooth out winter peak.)
2. Keeps gas in the public mind as a *modern* fuel.
3. An immense potential load, both Process and Comfort.
4. Next big industry—new and coming along fast and so recognized by the general public.

Therefore, since the demand exists, and since gas dehumidifiers are best suited and lowest in coat, gas will with an aggressive promotional campaign, secure and maintain the major portion of this desirable business.



Humidifier delivering conditioned air to the plate room of a litho plant. This unit is mounted on a platform and thus does not take up any valuable floor space.

Harry W. Smith, Jr. Leaves Laboratories To Go With New Jersey Zinc

On October 1, 1936, Harry W. Smith, Jr., Assistant in the Publications Department, American Gas Association Testing Laboratories at Cleveland, resigned to take a position in the Market Development Division of the New Jersey Zinc Co., 160 Front St., New York City.

Mr. Smith came to the Laboratories in November 1931 with experience in acoustics gained at the Bell Telephone Laboratories, New York City. After completing an assignment in the industrial gas research work on the Elimination of Noise in Industrial Gas Burners, he served in the Publications Dept.

Cement Mortar Protection for Distribution and Service Lines

By

Dennis J. Manning

Elizabethtown Consolidated Gas Co.

ACID soils in many sections of the territory served by our company have caused rapid corrosion of steel pipe on distribution lines and house service connections. Localized pitting has resulted in early leakage which has brought about high maintenance and replacement costs.

Our interest in the use of concrete as a protective coating to combat this condition was aroused by the discovery in our distribution system of an old 10-inch sheet iron pipe encased in two inches mortar about three feet under pavement which was laid in 1856. In replacing this line recently the metal was found to be in a good state of preservation, in fact the surface was actually bright when the mortar was removed. A sample showing the sound condition of the pipe is shown in Fig. 1.

The contrast between such service from a mortar-encased, thin sheet metal pipe, compared with unprotected distribution and service lines which were only a few years old, started our investigation of cement mortar protective coatings in 1926.

The results of these studies and trials over a period of 10 years were presented in part at the Distribution

Fig. 1. Cement Coated Pipe laid in 1856

Conference of the A. G. A. in Memphis last April.

Distribution and service lines protected with mortar coverings have been taken up after 10 years use and found to be intact. This cement mortar mixture provides a continuous dense coating which prevents acid, soil or any great quantity of free ground water coming in direct

Fig. 2. Troweled Coating on service line.

contact with the pipe. Furthermore the alkaline nature of the cement mixture serves to neutralize the acid waters which may seep through to the pipe due to imperfections in the coating which may develop. As the degree of soil acidity will vary in different locations, lime is added to the cement mortar as an additional neutralizing agent. The mixture adopted by us is one part of Portland Cement, two parts of hydrated lime and six parts of sand. Where the soil acidity is known to be mild the proportion of cement is increased and the lime reduced for the sake of added strength and rapidity of set.

As it is desirable to back-fill the trench as soon as possible after the covering is completed so that barricades may be removed, a quick setting type of cement is usually employed.

Should cracks occur in the covering due to settlement or other causes allowing free movement of water to the pipe, it is fair to assume that the water will become neutralized through contact with the alkaline coating and that small cracks will heal or be filled by calcium hydrates or carbonates built up from the coating. The same neutralizing action occurs where moisture may percolate through the coating as a result of imperfections in application or porous spots.

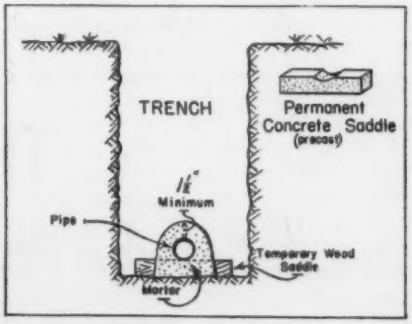


Fig. 3. Method of Supporting Pipe with Wood or Concrete Saddles.

Method of Application

The accompanying diagram and photos show how the work is carried on. After tamping the bottom of the trench, the pipe is laid on wood or pre-cast concrete saddles as shown, which support the pipe a minimum distance of 1½ inches from the floor

Coating on 10" distribution line.

of the trench. The mixture above described is then troweled on to minimum thickness of 1½ inches. When wood supporting blocks are used, these are removed after the coating has stiffened sufficiently to support

the pipe and the spaces filled with mortar. If precast concrete saddles are used the troweling is continuous and the saddle forms an integral part of the coating.

Our experience over a period of years has shown this type of coating to be so satisfactory that it has been adopted as standard practice for all our steel pipe lines up to 3-inch diameter.

Quantities and Costs

The following table gives an estimate of material and labor costs for standard 1¼-inch service pipe per 100 feet of length. Total cost shown includes coating operation only and does not cover trenching and back-fill.

Materials					
Cement Bags	Lime Bags	Sand Cu. Yds.	Cost Materials	Labor Cost	Total Cost
1.25	2.50	0.30	$2.98	$1.93	$4.91

This method of pipe protection is not limited to service lines only, but has been used by us on our distribution system for steel pipe up to 10-inch diameter wherever the soil is of a rapid corrosive nature. Our method of application for larger sizes does not employ the troweling method but we use wood forms which are moved along the pipe line as the application progresses. The illustration shows part of a 10-inch distribution line, 2,000 feet of which have been coated with the 1 : 2 : 6 cement mixture. Approximate cost per foot, including all materials and labor but not including trenching and back-fill, we estimate at about 38 cents.

The Eyes Have It!

A Colorful Program Introduces the Story of Gas Appliances to Southern California Consumers

by

J. J. Stapp

COLOR, human-interest, and drama have been forged to tell a forceful story of gas appliances to Southern California consumers. Sugar-coating a vital sales story with those qualities, the Advertising Department of the Los Angeles Gas and Electric Corporation has recently launched a dealer program of a unique variety, and one which is drawing widespread comment both from dealers and the general public.

The program is based on a novel magazine, "Homecraft." From that base, dealers, appliance manufacturers and the Utility are cooperating in the business of developing a wider market for gas appliances through making the consumer's eyes sell him on gas for every use.

Each of the three—dealer, manufacturer and Utility—contribute a share toward making this campaign successful. Thus the exploitation burden rests lightly on the shoulders of all and a balanced merchandising system has been attained. Heretofore it has not been uncommon for utilities to bear the greatest share in building consumer interest in gas appliances. The factor of dealer-disinterest has, therefore, acted as a handicap in proper appliance exploitation.

A Well Planned Merchandising Program

This factor has a psychological side as well as being constituted to warp the selling picture. Dealers take the attitude: "Let the utility do it." The result is that the individual dealer's merchandising is not as effective as it might be. At the same time the major exploitation expenses inhibit the utility. But when all who will benefit from a broader dissemination of the gas story are enlisted in a co-operative campaign the dealer's merchandising backbone is considerably stiffened and at the same time exploitation expense rests lighter on the utility.

Instead of carrying all the burden, the utility now carries only its share. A well planned merchandising program, one that will actually arouse eager public response and thus convince the dealer that it will pay him to co-operate may be depended on to bring better results in introducing gas appliances into the home.

The magazine, Homecraft, and its method of use is almost the "ideal" goodwill builder in this respect. It is a house-organ with a punch—a house organ for every gas appliance dealer in the territory and also for the Utility. With it he makes friends . . . and sales. With it the Los Angeles Gas and Electric Corporation has produced a factor of material value in building gas load.

Use of the Magazine

The magazine is produced so the dealer may use it in a number of ways. It is suggested that he employ "Homecraft" as a door-opener. By calling on home makers in his territory and presenting a copy of this attractive magazine he is able to establish valuable contact. Several dealers have reported immediate sales of gas appliances and others are reporting important repair jobs as a result of employing this magazine as a door-opener.

The dealer may also build up a mailing list by offering to send the magazine to the home as each edition appears. He may also use it as "something to remember him by" when talking to prospects on the floor of his store or shop.

Co-operation has been worked out along the following lines, by A. T. Gray who is in charge of Dealer Advertising for the Utility. Each dealer wishing to co-operate pays five dollars. For that sum he receives 25,000 copies of the magazine to use as he sees fit. The gas appliance manufacturer pays a small rate for display advertising. The remainder of publication expense is borne by the Utility. For his five dollars the dealer not only receives 25,000 "house organs" but also obtains a small advertisement beneath the advertisement of the gas appliance manufacturer.

Many dealers have seen fit to take four or more such insertions, beneath the various appliances which they are featuring in their stores and shops. The territory was divided into eight districts for this purpose, so that the dealer's name appears only in his district. In this way there is not a long and distracting list of small space ads and the dealer con-

centrates his advertisement in his immediate territory.

Such was the tentative advertising arrangement. But in order to gain wider dealer co-operation in the future, Mr. Gray plans to eliminate all dealer-names from inside pages in the next edition. Instead, the dealer will have his name printed on the front of his twenty-five thousand magazines. This will give him an "exclusive" house-organ, and he will not be advertising his competitors as he distributes the magazine in his chosen way.

How the Utility and Manufacturer Use the Magazine

Each edition of the magazine (there have been two at this writing) is also distributed at the cashier's offices of the Los Angeles Gas and Electric Corporation. Here they are placed in a conspicuous location and persons are invited to "Take One." The fact that they have been going out of the main office at the rate of one hundred per hour during the day convinces Mr. Gray that the public has found something it likes.

A manufacturer test also proved that the magazine has a definite selling appeal. In the last edition a prominent automatic, water heater manufacturer offered a free hot water attachment, a small gadget for spraying dishes. In the first month he had over five hundred of the coupons on which this offer was made clipped and turned into his office.

This proves that a magazine of definite merit will be read, even though it be loaded toward exploiting an industry. Naturally, the magazine is of high calibre both in artwork and reading matter. It is done in Rotogravure because this method suggests pictures and the "public likes pictures," as Mr. Gray points out. There were sixteen pages in the first edition and twenty-four in the second. No attempt will be made to issue the magazine at regular intervals. Instead, the Advertising Department will wait until a well-rounded organ can be published and will then bring out the new edition. In the meantime distribution of the current edition will be continued.

Enlisting Motion Pictures

A chief source of consumer appeal has been found in enlisting co-operation of the motion picture studios. A tie-in with Metro-Goldwyn-Mayer was used on the first edition, after which the Advertising Office received calls from other major studios and found them receptive to the idea. These stated that they would be willing to work with any other gas utility on such a tie-in. (Details cannot be covered within the scope of this article but will be furnished by your correspondent to interested persons addressing this magazine).

Stars that are to be featured in each issue are carefully selected for human-interest and the "homey" touch that will appeal to housewives. The first edition featured Una Merkel and the second May Robson. In both a double-truck was devoted to the star's home life, showing her especially engaged in working about her kitchen with gas appliances. In the second edition other stars were used, posing with appliances of various manufacturers.

Homecraft also uses an editorial page dealing with gas and gas appliances, giving tips as to appliances, and otherwise telling the gas story. Another page is devoted to informative paragraphs about events in and around Los Angeles, interesting bits of scenery, places to visit, new ideas for the kitchen.

A generous number of recipes are given in each issue. These are called to the home maker's attention by stressing the number of new recipes in the magazine, on the cover page. All women are interested in new recipes, especially ones that have been tested by approved home economists, and consequently this factor is as important in its way as the pictures of movie stars are in their's —the latter giving immediate appeal and the former inducing the housewife to keep the magazine until she can try out some of the recipes.

In summary, this is a triple-assist idea, from Utility to manufacturer to dealer. Each interested party does his part in making the telling of the gas story most effective. In that way the Utility gains a wide audience, reader appeal, and a persuasive selling story at a low cost, considering the value of the exploitation and the masses that can be reached.

Draft Hoods Group Proposes New Standards

Recommended revisions to the American Standard Listing Requirements for Draft Hoods (Z21.12-1933, Effective July 1, 1934) were completed by the interested subcommittee at the last meeting of that group at the Testing Laboratories in Cleveland on September 15, 1936. The proposed revisions were subsequently printed in booklet form and distributed in October to all member companies of the American Gas Association and others interested for their criticisms and suggestions.

Only one or two minor changes were made in the requirements for construction, but the performance requirements were entirely rewritten. The revised performance requirements are divided into two sections, Part II, Draft Hoods for Use with Gas-Converted Central Heating Equipment and Part III, Draft Hoods for Use with Gas Water Heaters and Gas-Converted Water Heating Equipment. Since draft hoods sold as separate units are generally used with the equipment mentioned, the committee decided it was preferable to use test conditions which simulate as nearly as possible those encountered in actual service. Whereas the test equipment and procedure have been altered, the limits of performance under up-draft, down-draft, and blocked flue tests remain the same. In the case of the spillage test, however, the lengths of flue piping used above the draft hood outlet have been increased from 4 and 5 feet to 8 and 9 feet for vertical and horizontal hoods, respectively.

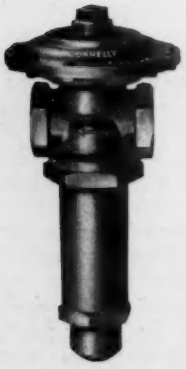
Under the new standards, satisfactory test results with a 3-inch nominal inlet diameter draft hood attached to a manual circulating tank type water heater will permit listing of a 4-inch diameter diverter also, when the essential dimensions and areas are in proportion within a certain tolerance. Likewise, listing will be extended to 5-inch and larger draft hoods, when all test requirements are met by a 6-inch unit connected to a standard make coal boiler equipped with a gas conversion burner.

The present performance requirements are based on pressure drops at definite rate of flow of warm air through the draft hood under blocked flue, downdraft, and up-draft test condition; while the proposed requirements are derived from the draft hood tests now applied to various vented gas appliances. Manufacturers will find it easier to duplicate these tests in their plants without highly specialized apparatus.

The committee's discussion of the relative merits of stannic choride and titanium tetrachloride for the visual study of drafts is of much interest.

New Equipment

Connelly Screwed Diaphragm Accurate Relief Valve



An accurate Relief Valve or Regulator for line pressures up to 125 lbs. Can be furnished to open accurately at any pressure from 1 to 100 lbs. and when closed will not leak. Seats are selected to suit conditions. They are made in all sizes from ¼" to 4". Further details in Bulletin 302-A, Connelly Iron Sponge & Governor Co., Chicago, Ill.

Reynolds New Range Regulator

Reynolds new R-10016-E2 Regulator with automatic cut-off is designed for use on automatic gas ranges. It is small and extremely compact, affording easy installation. The body is of brass. Operation is spring type. It is recommended for low inlet pressure reducing to inches W.C. in any installation where the automatic cut-off is desirable.

Reynolds New Refrigerator Regulators

The new R-10070-E2 Reynolds Gas Regulator, primarily for use on gas refrigerators, is equipped with automatic cut-off. Of course, this regulator is also ideal on pilot control or on any installation where accurate pressure control of small volume is required.

The body is designed of brass, spring type operation. This new model supplies the growing demand for a small compact regulator for reducing pounds to inches W.C. and where an automatic cut-off is not only desirable but necessary. On the low pressure refrigerator installation, regulator R-10070-E2 reduces the line pressure to satisfactory pressure for operation of the low pressure refrigerator regulator. Further details in bulletins of Reynolds Gas Regulator Co., Anderson, Ind.

Dual Continuous Control for Welding Arcs

For arc welding control a dialing method is described in Bulletin 412 of the Lincoln Electric Co. of Cleveland, O. On the left is shown the dial used for voltage control for selection of the proper type of arc. The current control dial on the right enables the welder to adjust the intensity of the arc. Each control may be advanced or retarded as desired in large or fine steps.

and Appliances

New Spray Gun

Department maintenance superintendents, whose problems include repainting of equipment and plant interiors and exteriors, will be interested in a low-cost, efficient outfit including a small gas-powered air compressor, a spray gun and the necessary hose and nozzle connections.

The new Saylor-Beall spray gun shown here combines both internal and external atomizing nozzles, a feature which makes it available for all the various jobs it is called upon to do in gas plants.

Low pressure internal atomizing is the most economical system for applying most liquids because such nozzles give the greatest coverage per cubic foot of air used. On the other hand some materials, such as fast drying lacquers, must be atomized after they leave the gun. The Saylor-Beall gun can be quickly changed to handle such materials and results in an all-purpose spray.

The Saylor-Beall Mfg. Co., Detroit, Michigan, who are introducing this new gun, manufacture a large line of air compressors and accessories, including low-cost outfits especially designed for general maintenance service.

Saylor-Beall Spray-Gun

Skinner Clamp for Pipe Leaks

Emergency Pipe Clamps

Clamps for emergency use to stop leaks in high or low pressure pipe lines carrying gas, air, steam, water, oil, ammonia, brine and chemicals are shown in the adjoining illustration. They are made of special composition metal, hinged on one side and equipped with cadmium plated steel bolts and rubber gasket. Made in sizes ranging from ½ inch to 12 inch by M. B. Skinner Co., 3615 W. Sample Street, South Bend, Ind. A pipe joint clamp for leaks at threaded joints and a long model of pipe line clamp for splits or corroded areas are also offered by the Skinner Company.

New Magic Chef Gas Range, Series 4700

A divided top range with advanced features. Due to its size and weight, it has a "double-body-side" construction. In addition to standard Magic Chef equipment there is a minute minder mounted in the guard rail, as are the new style gas valves, semi-direct action oven with new "V" type, cross fire burner, which provide an intense heat that is easily controlled. There are two burners on each side of work top. Oven and broiler completely insulated. A product of American Stove Co., Cleveland, O.

Connelly Auto-Vent Back Pressure Valve

This valve is designed to relieve accumulated pressure in case of reverse flow due to air at higher than gas pressure for industrial installations. Made weight and spring loaded. It combines the Connelly back pressure valve with the additional safety that the relief provides. These Auto-Vent valves are made in two sizes, ¾" and 1½". For large back presssure valves, the Auto-Vents are mounted as shown.

Ready For The Press!

Domestic Gas Ranges

by

Charles W. Merriam, Jr.

Partial Table of Contents

- Relative Merits of cooking equipment using different fuels
- Types of Ranges
- Console vs. Table Top
- Construction Materials
- Oven Types
- Temperature Control
- Insulation
- Automatic Oven Lighting
- Types of Burners
- Comparative Efficiencies
- Flexible Control
- Fuel Economy
- Relative Costs of Gas vs. Electricity
- Burner Arrangements
- Retail Prices

- A handy and informative volume filled with authoritative information on types, characteristics, design, operation, heat control and advantages of the modern gas range.
- A reference book of great value to every range salesman and sales-manager.
- An invaluable manual for sales department study and discussion groups.
- Eighty pages of the real essence of range construction and operation.
- Size 6" x 9", durable paper cover. Price $1.00. Discount on Quantities. Order your copies now.

AMERICAN GAS JOURNAL
53 Park Place New York

Gas Fired Tempering Furnaces Reduce Fuel Cost

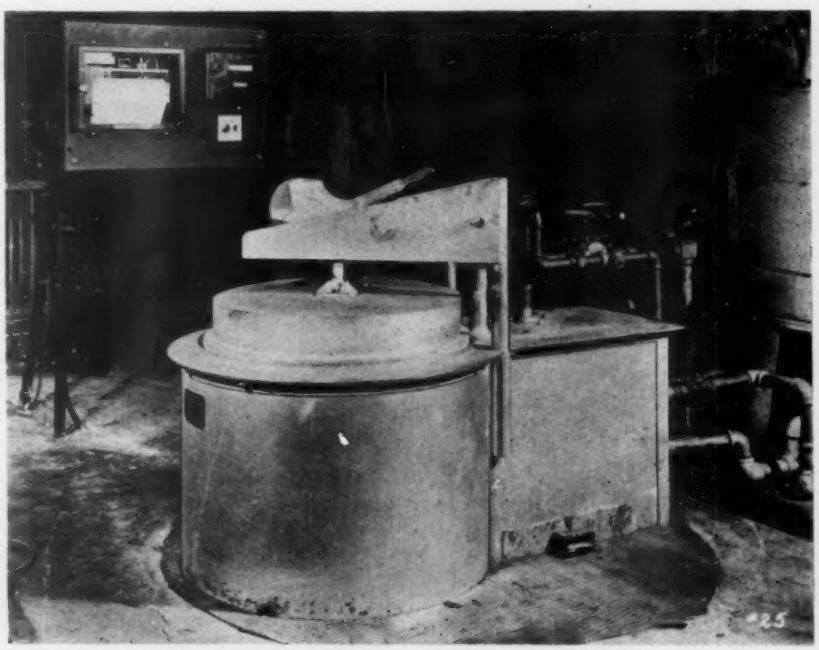
Capitalizing on the advantages of its position as the largest steel treating establishment in the country, the Lindberg Steel Treating Company of Chicago has registered a hit with its recently developed "Cyclone Gas Fired Tempering Furnace."

Tested by months of steady use in its own plant, the tempering furnace, developed by Lindberg's affiliate, The Lindberg Engineering Company, has been installed in a number of plants in this country and abroad, with uniformly successful results.

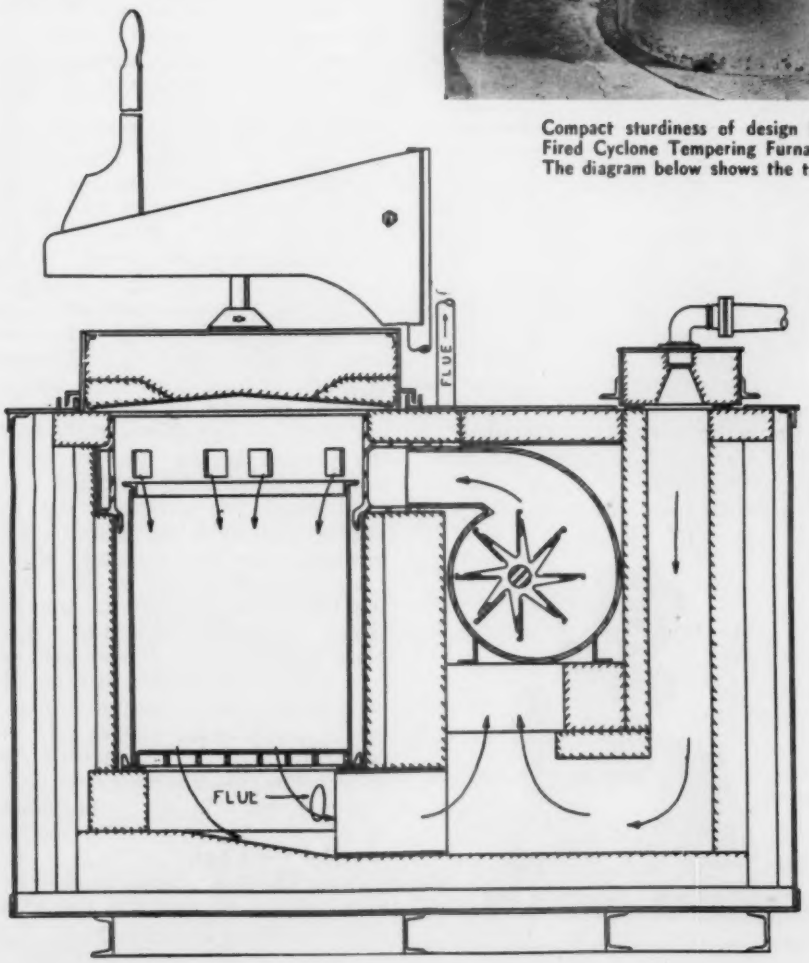
Until the development of this furnace it had not been considered feasible to use gas as a fuel for tempering furnaces. Gas-fired furnaces were difficult to control accurately, because of the high temperature of the heating medium and the excess heat built up during combustion, which caused overshooting of the temperature level.

The design of the new gas-fired furnace is based on the knowledge gained from construction of an electric furnace, early in 1934. The chief difference in the construction of this pioneer furnace was the location of the heating units, which were placed some distance from the work chamber to provide absolute control of the work chamber temperature regardless of the temperature changes in the heating unit chamber.

Based upon these proved principles, the Lindberg Company designed and constructed a gas-fired furnace which was installed in the Lindberg Steel Treating Company's plant in July, 1935. At the time, it was anticipated that some months of development and many changes in design might be necessary.



Compact sturdiness of design is shown in this illustration of the Lindberg Gas-Fired Cyclone Tempering Furnace. Controls are located on the board at the left. The diagram below shows the travel of the hot gases through the charge when the burner is on.

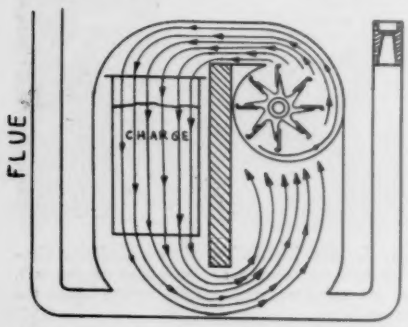


This unit went into regular production at all temperatures 24 hours a day and proved in every way equal to the electrically heated units operating alongside it. Its operating cost, with electricity at 1c a kilowatt and gas at 38c per thousand cubic feet with 800 Btu. heating value per thousand, proved to be one-third that of electricity.

The accompanying diagram shows the essential features of construction of the new "Cyclone" furnace. A powerful motor driven fan drives a tremendous amount of air at high velocity through the fan chamber which is interposed between the

combustion chamber and the work chamber. The hot gases in the combustion chamber are mixed in proportions of approximately 1 to 50 with the rapidly circulating gases. This mixture passes up through the fan, enters the annular distribution duct at the top of the work chamber, and is drawn down through the work container, and back into the fan chamber. When the temperature, which is read by a pyrometer measuring the air as it leaves the fan, reaches control temperature, the burner is closed tightly by a motor operated valve.

The schematic diagrams illustrate what happens. Although the combustion chamber is on the suction side of the fan, circulation ceases entirely through the combustion chamber and a cyclonic blast of air continues through the work chamber. This same schematic diagram illustrates the release of the flue



This diagram shows operation of furnace during the period in the cycle when the burner is off.

gases. The flue is on the suction side of the fan, which results in a slight back pressure that acts as a check valve. Gases escape from the flue only when the burner is on, which forces out the excess gases of combustion against the back pressure in the flue. Note that the flue gases cannot leave the furnace until after passing completely through the work, and that when the work is being brought to temperature, which is the time that most of the gas is being burned, the flue gas temperature must obviously be somewhat less than the operating temperature of the furnace.

Once the furnace goes on control, the automatic control, which operates in conjunction with the control pyrometer, reduces the heating rate to exactly equal the heat absorption of the furnace. This feature entirely eliminates thermocouple lag, such lag being a major cause of overshooting. Where the heating rate towards the end of a heat, for example, greatly exceeds the heat absorption of the furnace and charge severe overshooting would occur. However, where the rate of heating is automatically reduced to the rate of heat absorption of the furnace and charge such overshooting is eliminated. This furnace has proved for the first time that gas is superior to all other fuels for batch type tempering.

Mystery Chef Radio Program Goes Into Second Year

The directors of Regional Advertisers, Inc., by unanimous vote, have decided to continue the Mystery Chef radio program for another year starting December 1, 1936 and ending November 27, 1937, for a total of 104 broadcasts over the split red network of the National Broadcasting Company. Eastern stations to be used are identical with those now in use, namely:

WEAF, New York; WNAC, Boston; WTIC, Hartford; WJAR, Providence; WGY, Schenectady; WBEN, Buffalo; WTAG, Worcester; WCSH, Portland; KYW, Philadelphia; WFBR, Baltimore; WRC, Washington; WHAM, Rochester; WSYR, Syracuse.

Eight companies on the Pacific Coast have also joined the Eastern companies in continuing the program, using the facilities of the following stations:

KDYL, Salt Lake City; KFI, Los Angeles; KGW, Portland; KOMO, Seattle; KHQ, Spokane.

The program will be broadcast over the Eastern stations, with the exception of Rochester and Syracuse, which use transcriptions, at 11:30—11:45 A.M. New York time, Tuesdays and Saturdays. Pacific Coast companies will receive the program as rebroadcast from NBC studios in New York by transcontinental telephone at 1:00—1:15 P.M. New York time on Tuesdays and Saturdays (10:00 to 10:15 A.M. Pacific time and 11:00 to 11:15 A.M. Mountain time.)

Contracts for a second year's continuation of the program call for participation of Eastern companies having nearly 5,000,000 gas meters in operation and Pacific Coast companies having approximately 1,000,000 meters in operation. In addition, a number of companies will continue to use the program over their local stations by means of electrical transcriptions.

Demand for the recipe book "Be an Artist at the Gas Range" has reached such proportions that a large reserve supply of books held at the printers at Buffalo, New York, has been completely exhausted. As of November 24 more than 1,000,000 books have been moved from the printers to participating companies on order. The directors of Regional Advertisers have authorized an additional printing of 500,000 books and these are expected to come from the presses at the rate of 50,000 copies a day starting December 9th.

Although the program for the coming year will not differ fundamentally from that presently broadcast, there will be a closer tie-in with the themes emphasized in the national advertising program. Also, more material of a commercial nature will be introduced, particularly in reference to the latest improvements found on gas ranges. In the new edition of the recipe book and in future scripts the waterless cooking method will be recommended along with the low water method used by the Chef.

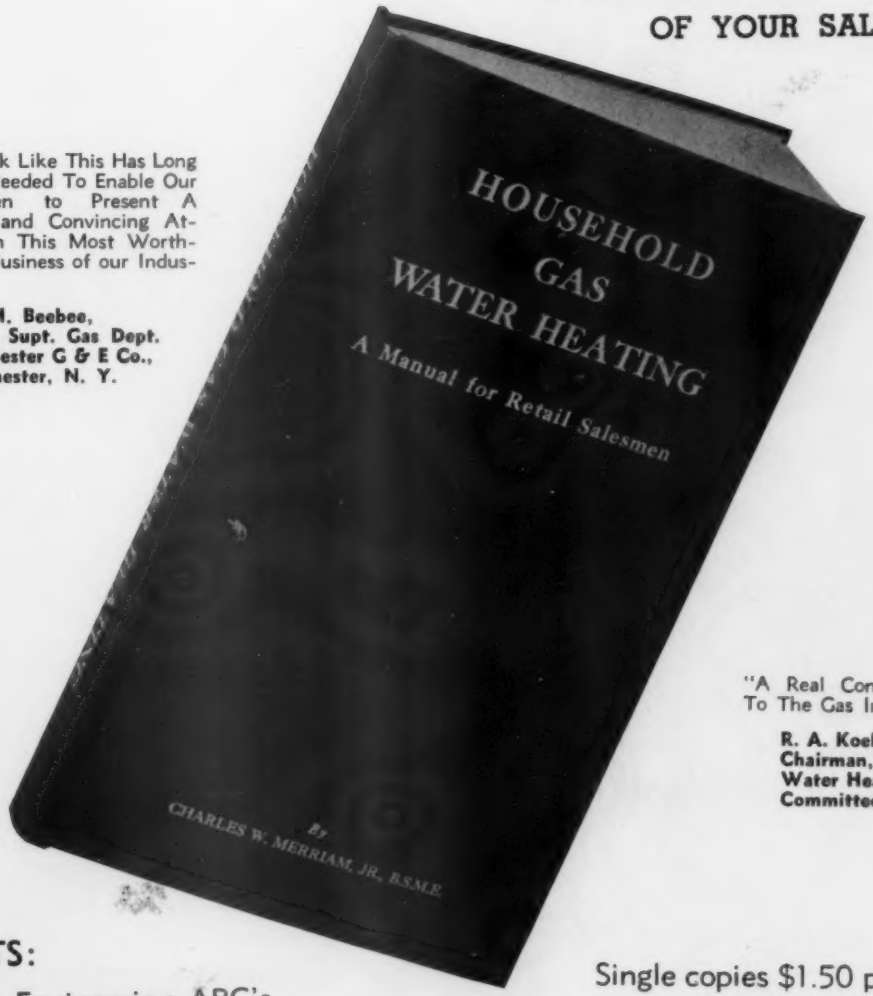
A number of companies will resume the use of electrical transcriptions beginning in January.

HANDBOOK ON WATER HEATING

A VALUABLE AID TO EACH OF YOUR SALESMEN

"A Book Like This Has Long Been Needed To Enable Our Salesmen to Present A Sound and Convincing Attack on This Most Worthwhile Business of our Industry."

A. M. Beebee,
Gen. Supt. Gas Dept.
Rochester G & E Co.,
Rochester, N. Y.



"A Real Contribution To The Gas Industry."

R. A. Koehler,
Chairman, A.G.A.
Water Heating Committee

CONTENTS:

Chapter 1—Engineering ABC's
Chapter 2—Water Heater Types
Chapter 3—Hot Water—How Much?
Chapter 4—Gas Consumption for Water Heating
Chapter 5—Water Piping & Installation
Chapter 6—What Size Heater
Chapter 7—Automatic Heater Accessories
Chapter 8—Competitive Water Heating
Chapter 9—Hot Water—For What?

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AMERICAN GAS JOURNAL
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News of the Gas Industry

R. M. Martin, Art Director

Raymond M. Martin, who has been director of display for the Consolidated Edison Company of New York, Inc., was appointed art director on November 1, according to an announcement by Henry Obermeyer, assistant to the executive vice-president. Mr. Martin will retain supervision of all display and poster activities of the Consolidated and its affiliated electric, gas, and steam companies,

Raymond M. Martin

while his new duties will include art direction of all types of advertising.

Mr. Martin joined the Consolidated Gas Company in 1922, in the sales end of the business, and two years later was made director of display. In 1933, when the advertising bureaus of the Consolidated and the Edison companies were merged, his activities were extended into the electric business. Subsequently the display work of the Brooklyn Edison and Queens Electric companies was placed under his jurisdiction.

At present the Display Division turns out from 400 to 500 window displays a year, about fifty posters of all types, and has charge of about twelve major exhibits. The Division also supervises several cooperative gas exhibits sponsored by the American Gas Association.

Miss White Joins B. B. D. & O. Co.

Grace W. White, formerly with Roberts & Mander Stove Company, Philadelphia, has been appointed home economist of the test kitchen at Batten, Barton, Durstine & Osborn, New York.

New Jersey Gas Association Holds Regional Meetings

Over 2,500 gas men and women attended the regional meetings of the New Jersey Gas Association held at Asbury Park, Newark, Hackensack, Vineland and Camden on different evenings during November. A program that was instructive and entertaining was offered from the 10 gas company and 45 manufacturing company members.

William Walsh, of the Elizabethtown Consolidated Gas Company discussed the flexibility of gas for cooking, pointing out that the user of a modern gas range does not need to adapt her cooking preferences to the requirements of a range. The gas range is adaptable to any type or method of cooking. He advocated strongly the use of time control as a means of bringing greater convenience and modernization to the kitchen.

A playlet entitled "Work for the Salesman, and He will Work for You" portrayed a typical sale of a gas water heater on an evening call. The purpose of the sketch was twofold, first to outline a suitable selling method for salesmen; and second to show non-selling employees the effort that is put back of leads they turn in. The cast of three persons included Mr. and Mrs. Pierce, prospective purchasers of water heating service by gas, and Mr. Stewart, gas company salesman. Separate groups presented the playlet at the different meetings.

The second annual prize paper contest was announced at the meeting, the subject of the paper being "How Can I Help My Department Contribute Most to My Company in 1937." Last year's contest attracted over 75 papers.

W. S. Potter, Treasurer of the Elizabethtown Consolidated Gas Company, and President of the New Jersey Gas Association spoke briefly before all meetings.

Morrison and Cummins, Vice Presidents of Standard Gas & Elec. Corp.

Bernard W. Lynch, president of Standard Gas and Electric Company, has announced the election of M. A. Morrison as vice president, the election of Albert S. Cummins as vice president, secretary and director, and the election of General Charles Keller as a director of the company.

Mr. Morrison, who for a number of years was secretary and treasurer, has resigned from the office of secretary.

Mr. Cummins has been associated with H. M. Byllesby and Company and affiliated companies since 1914, and has had experience in many phases of public utility operation and finance.

General Keller has been special assistant to the vice president in charge of the engineering department of Public Utility Engineering and Service Corporation and its predecessor company, Byllesby Engineering and Management Corporation, since he became associated with the organization in 1923. He is a former army engineer, and has wide experience in public utility affairs.

N. A. Naylor Joins Spencer Thermostat Company

N. A. Naylor, until recently Eastern Sales Manager of General Controls Company, has become associated with the Spencer Thermostat Company, of Attleboro, Massachusetts.

Mr. Naylor will take charge of the company's new branch office in Cleveland, Ohio. He is a graduate engineer of University of California, and has spent most of his time in the heating and automatic temperature control field.

Timely and Attractive Window Display of Consolidated Edison Co., New York.

For Gas Ranges!

to the famous Robertshaw oven-heat-control has been added Thermal Eye

Sight!

When the oven reaches the temperature set by the dial a RED SIGNAL comes into view—showing the user that the oven is ready for use!

Action!

Selling action! That's what the Robertshaw Thermal Eye supplies. It catches the eyes of prospects. It increases their interest in your gas range. It gives the salesman something he can talk about—and dramatize!

Thermal Eye stands as the biggest thing that's ever happened in oven-heat control. Its selling influence is important to you. Write Robertshaw for Thermal Eye folder.

FRONT-OF-RANGE ADJUSTMENT—An improvement that saves service hours! Oven by-pass and safety pilot are easily adjusted with a screw driver (at points B and P in illustration above).

ROBERTSHAW THERMOSTAT COMPANY, Youngwood, Pa.

Over 2,700,000 Robertshaw controls are in use

Complete Gas Exhibit at Staten Island Exposition of Progress

Following up its successful promotion of the Model All-Gas Home, the Staten Island Chamber of Commerce staged the most successful event in its history—the annual Exposition of Progress at which all the local industries displayed their wares. The attendance shattered all previous records—a total of 110,700 visitors being registered during the eight days of the exhibit from October 16 to 24. This represents approximately 66 2-3% of the total population of Staten Island. "One important reason for this record-breaking attendance is the great attraction of the Model All-Gas Home which was awarded by the Staten Island Chamber of Commerce as a door prize" said Mr. C. A. Kennedy, Sales Manager of the New York & Richmond Gas Company and one of the main forces behind this successful effort.

Gas service and modern gas appliances dominated this exhibit. The New York & Richmond Gas Company and its group of eight cooperating manufacturers occupied 2,400 square feet of exhibit space in the attractive manner shown by the booths illustrated herewith. The decorative scheme tied in with the American Gas Association's national advertising program through the use of slogans and enlarged reproductions of local tie-in display material.

The theme of the display "There's Nothing Like Gas for Cooking, Water Heating, Refrigeration and House Heating" was convincingly demonstrated to every Staten Island resident by the complete and attractive exhibits of modern gas equipment for hotel and home shown by the New York & Richmond Gas Company in its large central booth and by the following manufacturers whose exhibits surrounded the gas company's display:—Standard Gas Equipment Corp., American Gas Products Corp., The Bryant Heater Company, American Stove Co., Cribben & Sexton Co., Whitehead Metal Products Co., John Wood Mfg. Co. and The Surface Combustion Corp.

A two-day cooking school was conducted by the New York & Richmond Gas Company as part of the program of Exposition attractions and was a great success under the direction of Mrs. Lois Shelton Ford. More than 1,250 women attended. A modern gas range was awarded as a special grand attendance prize with other valuable daily awards including the foods cooked.

Appliance sales of this company are running more than 35% ahead of last year.

Oil as Fuel

In the October 15, 1936 issue of "Oil and Gas Journal," there is an interesting editorial containing the following passage:

"Part of the excess stocks of gasoline that were built up during last winter and spring was due to the desire of refiners to supply fuel oil demand. This does not mean that the oil industry should discourage the utilization of petroleum as fuel but the trend over a period of time will be to confine that utilization to consumers who can afford to pay more for a superior fuel."

Should this thought serve as a basis for action on the part of the oil industry, it would have very important repercussions in the growth of gas house heating sales in territories where oil house heating costs are now a great deal less than gas. The excessive amounts of gasoline produced as a by-product when domestic fuel oil is the primary product hang over the motor fuel market of the following spring and depress prices in the most profitable business of the oil industry.

The editorial continues:

"It is far better that the oil industry sacrifice that market which adds nothing to the profit of the industry than to try to supply it and in so doing over-produce products for which the whole country relies on the oil industry. . . . Why waste the corn and save the husks?"

Pacific Coast Gas Sales Show Increase

Tabulated reports for the first nine months of 1936 as compared with 1935 issued by Pacific Coast Gas Assn. show satisfactory gains in production, active meters, sales in MCF, and gross revenue in all sections in spite of sharp rate reductions by the companies serving Northern and Southern California. During this period the Southern Oregon Gas Corp. changed over from water and oil gas to butane-air gas. The greatest percentage gains are recorded by the Arizona-Nevada group with MCF sales gain of 35.4% and revenue gain of 19.7%. Substantial rate decreases are reflected in these figures.

LEE B. METTLER

Lee B. Mettler of Lee B. Mettler Co., Los Angeles, Calif., died Nov. 13th of a severe heart attack. Mr. Mettler was born in Adrian, Mich., Dec. 7th, 1874. He was associated with the gas industry for many years. For the past 15 years he has been head of the Lee B. Mettler Co.

Floyd L. Carlisle, Chairman New York World's Fair Public Utilities Committee

Floyd L. Carlisle, Chairman of the Boards of the Niagara Hudson Power Co., the New York Edison Co., and Consolidated Gas Company of New York, has accepted appointment as chairman of the committee of Public Utilities, which will participate in the campaign to sell $27,829,500 of debenture bonds to finance construction of the New York World's Fair.

The Committee which Mr. Carlisle will head is one of sixty-eight volunteer groups representing trade and industry organized by the New York World s Fair Bond Sales Committee. The Committee will offer the bonds among the power, light and gas companies.

The Fair opens April 30, 1939, the 150th anniversary of the inauguration of George Washington as president.

W. C. Mainwaring Becomes General Sales Manager

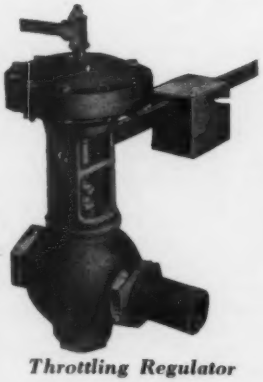
W. C. Mainwaring, formerly Merchandise Manager of British Columbia Electric Railway Company, has been asked to create a unified sales program for the gas and electric departments of the company with the title of General Sales Manager.

SUPERIOR

Diaphrams
Provers
Repairs
Service Cleaners
Gas Meters

SUPERIOR METER CO.
Brooklyn, N. Y.
167 - 41st Street

Control of Compressor Discharge is Perfect



Throttling Regulator

DISCHARGE pressure can not rise above the point for which the mechanism is set, if you use the C-F Throttling Regulator. When pressure tends to rise, suction is immediately throttled. Action is prompt, positive, precise, unfailing. Discharge control is definitely accomplished. The C-F Throttling Regulator is one of forty special types in the C-F line, covering all requirements of pressure control in the gas industry. Complete Catalog mailed on request.

THE CHAPLIN-FULTON MFG. COMPANY
28-40 Penn Avenue Pittsburgh, Pa.

The Outstanding Gas Purifying Material » » »

Highest H_2S removal combined with complete removal of traces. Physical structure insures very low box back pressures.

THE RECOGNIZED PURIFYING MATERIAL FOR VAPOR PHASE GUM CONTROL.

Ask for our new bulletins Nos. AL-18-19 which are very interesting

THE ALPHA-LUX COMPANY, Inc.
192 FRONT ST., NEW YORK
Philadelphia Chicago

New Servel Vice President

George S. Jones, Jr., of Dallas, Tex., has been appointed vice-president and general sales manager of the Servel Electrolux Sales Division of Servel, Inc., manufacturers of Servel Electrolux gas-operated and kerosene-operated refrigerators at Evansville, Ind., it was recently announced by Louis Ruthenburg, president of the company from its eastern offices, 51 East 42nd Street, New York City. Mr. Jones will have his headquarters at the Servel plant in Evansville.

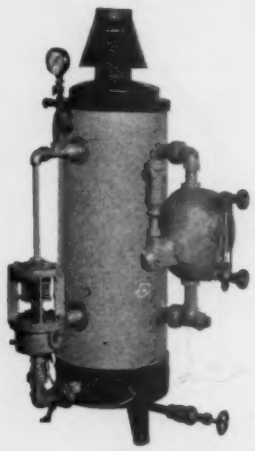
Mr. Jones has been with the Servel organization since 1933 in which year he became district sales manager at Dallas. In 1935 he was promoted to regional sales manager of the Southwestern region with headquarters at Dallas, a position he held until he became vice-president.

Chamberlain with Am. Gas Products Co.

Kenneth Chamberlain, who for the past seventeen years has been connected with the Gas Light Company of Worcester, Massachusetts, in a sales and engineering capacity, has been appointed sales representative in the Boston territory of the American Gas Products Corporation, a division of American Radiator & Standard Sanitary Corporation, according to an announcement by H. H. Dugdale, vice-president in charge of sales, of the company.

In New England, he will be associated with Edward B. Bangs, who was placed in charge of the Boston office of American Gas Products Corporation earlier this year.

INDUSTRIAL GAS BOILERS
Tubular or Flueless
¾ to 45 H.P.



P. M. LATTNER MFG. COMPANY
CEDAR RAPIDS, IOWA

Jim Donnelly Promoted

Jim Donnelly, formerly Sales Promotion Manager of Bastian-Morley Co., La Porte, Ind., has been promoted to Sales Manager effective November 16. Mr. Donnelly joined the company in 1923 after several years in the advertising and merchandising field. In 1926 he advanced to Advertising Manager and in 1928 was made Sales Promotion Manager. He now assumes the duties of Sales Manager, retaining the supervision of advertising and sales promotion.

Mr. J P. Hutchinson has been promoted to Assistant Sales Manager. Mr. Hutchinson joined the company sales staff at Minneapolis in January, 1929, being transferred to the general office sales department at La Porte later in that year, where he has specialized in gas boiler sales as well as assisted in general sales and sales promotion.

Visitor From Argentine Reports Need Of Kerosene Refrigerators

E. H. Hampton, head of Hampton, Watson and Company, an American importing firm of Buenos Aires which acts as the distributor in the Argentine for Servel, Inc., manufacturers of Servel Electrolux gas-operated and kerosene-operated refrigerators at Evansville, Ind., has just returned home after a seven weeks' visit to the United States.

Prior to his departure, Mr. Hampton stated that business in the Argentine was making headway in its march out of the depression and that the field was a good one for American manufacturers.

The policy of electric companies in the Argentine to furnish power only at night is an important factor in promoting the sale of gas-operated refrigerators, according to Mr. Hampton. The gas-operated end of the refrigerator business in the Argentine is carried on by the Primitiva Gas Company in collaboration with his firm.

New Koppers Ovens for Inland Steel Co.

Inland Steel Company, Indiana Harbor, Ind., has awarded Koppers Company, Pittsburgh, Pa., a contract for the erection of 59 coke ovens and for other construction and replacement at its Indiana Harbor plant. Work will start immediately and give employment to 300 men for 10 months.

New low differential type Becker ovens with self-sealing doors and other modern auxiliaries, will be installed. The ovens are equipped so that they can be fired with blast furnace gas.

The Inland Steel's benzol and by-product plants will be remodeled with modern equipment for the production of pure benzol, toluol, xylol and all grades of solvent naphtha.

Penn Electric Switch Co. Plans Extensive Advertising Campaign

Nelson B. Delavan, Vice President and Director of Sales of Penn Electric Switch Co., Des Moines, Ia., recently announced the appointment of The Cramer-Krassalt Co., Milwaukee, Wis., as advertising counsel. In making the announcement, Mr. Delavan commented at some length on the special need for a greater selling efficiency in the field of automatic heating.

In part, he said, "With the greater interest now being shown in automatic heating, the field may expect in the course of the next few years a great influx of appliance salesmen. As heating equipment has been sold primarily from a mechanical standpoint, this influx of appliance salesmen who are not mechanically inclined, presents a definite sales training problem to the automatic heating field. It is our opinion, based on surveys just completed, that there is a definite need in the industry for training salesmen along sales lines rather than along engineering and mechanical lines, as has been the custom.

"Various automatic heating devices, in the past, were not perfected to the point where mechanics could be ignored as a major consideration. Until now, it has been necessary to a great extent, to have mechanics and technicians handle the sales of automatic heating devices. Today, mechanical features are so perfected, that the problem is not one of manufacturing automatic heat but one of manufacturing customers for automatic heating.

"The Penn Electric Switch Co., therefore, will devote its efforts in this new advertising and promotional program to helping salesmen to a greater selling efficiency. This program will not be restricted to any type of heating appliance nor will it be restricted to those dealers who are only selling Penn equipped products. It is our theory and belief that the organization who makes a contribution to the 'manufacturing' of customers and profits for the heating dealers of America, will automatically take its proper place in the field. Our national advertising campaign will be devoted to selling the public automatic heating.

"Now that the home owners of America are seeking to further enrich their living environment, they will next turn to automatic heating. A marked upturn in installations may be confidently expected by the industry in the next few years. The extent to which the industry takes advantage of this situation depends to a very large extent upon the sales training given the men on the firing line. It is with this thought in mind that we enter this new merchandising effort."

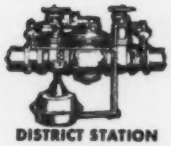
New Gifford-Wood Catalog

A new catalog of Material Handling Equipment has been issued by Gifford-Wood Co., Hudson, N. Y. In addition to many notable improvements in design and construction which embody the newest, approved ideas, the line of equipment has been amplified to meet practically every industrial requirement. The book contains, besides detailed descriptions of equipment, many tables and drawings which should prove valuable in planning material handling plants.

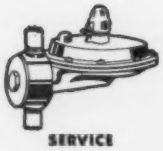
☆ Reynolds

FOR EVERY GAS CONTROL REQUIREMENT

HIGH PRESSURE


DISTRICT STATION

INDUSTRIAL


SERVICE

LOW PRESSURE

"If it is a gas control problem—see REYNOLDS!" Since the beginning of the industry's history, control problems have increased . . . become more and more complex.

Reynolds gas regulators, with over 40 years of experience in developing, designing, building and testing behind them, have developed with the industry.

Today . . . these *proved* Reynolds Gas Regulators are recognized by the industry's engineers as the thoroughly reliable, dependable control factors that have *more* than kept pace with the times.

Write our Engineering Department at the factory—or our nearest branch office or representative—for immediate and full cooperation.

☆

REYNOLDS PRODUCTS

High Pressure Service House Regulators—Straight Lever Type—Models 0-10-20 series; Toggle Lever Type—Model 30 series.

Low Pressure Service or Appliance Regulators.

District Station Regulators, Single or Double Valve—Auxiliary Bowl and Automatic Loading Device Optional.

High Pressure Line Regulators—Pilot Loaded—Pilot Controlled.

Toggle Type Regulators—Single Vavle, Double Valve, Triple Outlet.

Seals—Dead Weight or Mercury . Back Pressure Valves . Automatic Quick Closing Anti-Vacuum Valves . Automatic Shut Off Valves . Lever Operated Valves . Louver Operated Device . Atmospheric Regulators . Vacuum Regulators.

Branch Offices:
421 Dwight Building
Kansas City, Mo.
2nd Unit,
Santa Fe Bldg.
Dallas, Texas

Representatives:
Eastern Appliance Co.
Boston, Mass.
F. E. Newberry,
Avon, N. J.

REYNOLDS GAS REGULATOR CO.

ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

CHACE Thermostatic BIMETAL

USED *Exclusively* IN THE

BRYANT GAS-FIRED UNIT HEATER

THE BRYANT HEATER AND MANUFACTURING Co.

When "Bryant" and so many other leading manufacturers, whose products have such an enviable reputation for service and economy, adopt Chace Thermostatic Bimetal as standard, there must be some very good reasons.

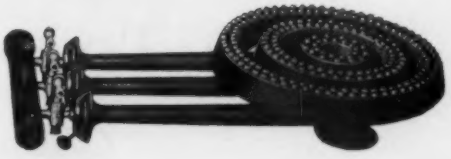
If your product calls for reliable, automatic action at a given temperature, use Chace Thermostatic Bimetal. Sold in sheets, in strips or formed for assembly.

W. M. CHACE CO.

1610 Beard Avenue - - - Detroit Mich.

JOHNSON NO. 40 ABC

Triple Atmospheric Ring Burners



This powerful Johnson burner is made up of three independent ring burners assembled into one compact unit. Each burner is individually controlled and has a separate Johnson Venturi Mixer and Tube, with heavy A.G.A. Type Valve. Easily and accurately adjusted primary air plus Johnson Patented Direct Jet Regulators on every burner produce perfect combustion and high flame temperatures. A highly efficient and economical open flame unit adaptable to many shop and industrial uses. Write for full details on this outstanding burner.

JOHNSON GAS APPLIANCE CO.

Cedar Rapids IOWA

Western Representative:
C. B. BABCOCK CO.
135 Bluxome Street
San Francisco, Calif.

Eastern Representative:
J. H. McPHERSON
250 Stuart Street
Boston, Mass.

Precision Scientific Co. Issues New Bulletin

Bulletin TS 3000, recently issued by Precision Scientific Co., Chicago, Ill., contains 24 pages and cover—tells how to conduct accurate B.t.u. tests with a Flow-Type Gas Calorimeter. Crammed full of information from cover to cover, this new manual contains detailed instructions, approved by the U. S Bureau of Standards, on how to set up the apparatus and conduct an accurate test; also includes essential calorimeter tables reproduced from Bureau of Standards Circular No. 65, now out of print. Covers the subject of flow calorimetry in a complete, practical and concise manner. Shows assembled and cross-sectional diagrams of the calorimeter, outline of test procedure; lists necessary precautions and significance of errors; includes a brief bibliography and information on calorimeter parts and accessories.

New Officers in General Refractories Company

The following officers were recently appointed by the Board of Directors of the General Refractories Company, Philadelphia, Pa.: Lionel Y. Greene, Vice President in Charge of Operations; Russell P. Hauer, Vice-President in Charge of Research; Drew M. Thorpe, Vice President in Charge of Sales.

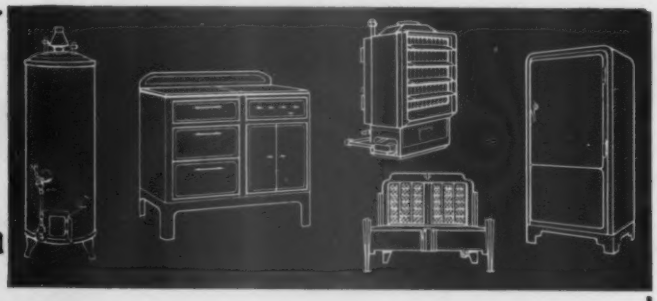
Thermometer Controllers

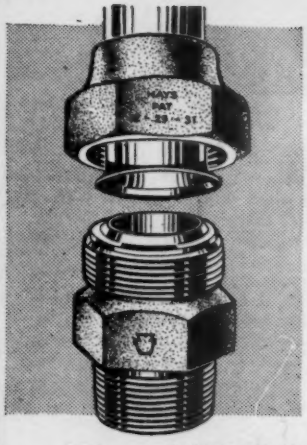
A broadside folder of the Brown Instrument Co., is entitled "Here's the Answer to Your Temperature Problem." It describes the various features of Brown Thermometer Controllers and illustrates how they may be "tuned" to specific process requirements. The ranges of both air operated and electric type controllers are given as well as a description of "Con-Tac-Tor" mercury switches. Copy may be had by writing The Brown Instrument Co., Division of Minneapolis-Honeywell Regulator Co., Wayne and Roberts Avenues, Philadelphia, Pa.

Research and Publicity

Organized for service covering all phases of business research, public relations, publicity, advertising and sales, The National Survey and Sales Corporation has been recently formed with offices at 120 So. LaSalle Street, Chicago. John M. Pratt, President has been active in this work in Chicago for the last 15 years and was also publisher of the Herald-Post of Louisville. William H. Murphy, Vice President and Sales Director has been for 25 years identified with Chicago newspapers including his recent activities as advertising director of Chicago Herald and Examiner.

Hook Them Up This Modern Way





Use Double Seals for Economy and Tighter Connections

Copper pipe is neat and flexible—Hays Double Seals make strong gas tight connections. Together they make a modern team worthy of the finest gas appliances. Note how the 2-faced pipe flare (45° + 90°) makes up on the 2-faced machined seat of the fitting. It's copper to copper with no sealing agent required.

Write for catalog.

400 STYLES & SIZES

HAYS MFG. CO. ERIE, PENNA.

Specify HAYS DOUBLE SEALS

Roots-Connersville Turbine Pumps

Roots-Connersville Blower Corp. of Connersville, Ind., has issued Bulletin 260-B11B describing its Type "T" turbine pumps, which have been on the market several years; and while the basic operating principle remains the same, numerous refinements have been included to provide for increased durability and improved performance.

The bulletin illustrates various driving arrangements which are available, and features two sectional views.

On page four is found a selection table, showing pumps for capacities from 5 to 200 GPM, at heads up to 300 feet. A performance curve and also a table giving specifications of the bronze-fitted, all-iron, and all-bronze pumps of standard construction are included.

Although the bulletin is primarily concerned with industrial applications, Roots-Connersville has incorporated the Type "T" pump in a complete line of domestic water systems and condensate return or boiler feed units.

A line of self-priming pumps, particularly well suited for handling volatile liquids, is now being developed.

Valves for Air-Operated Controllers

A 28-page illustrated bulletin No. 214 just published by The Foxboro Company, Foxboro, Mass., provides a comprehensive review of controlled valves of both the throttling and quick-acting "open-and-shut" type, as well as modern controller accessories for extending the practical application of automatic control.

A detailed discussion of operating characteristics, specifications and dimensions of the "Stabilflo" valves for throttling control is included, with particular emphasis on the significance of the 50 to 1 flow rangeability which gives equal percentage flow characteristics between 2% and 100% of valve capacity.

This bulletin also gives basic engineering data for computing valve sizes and rangeability for various fluids and operating conditions.

Burnham Gas Boilers

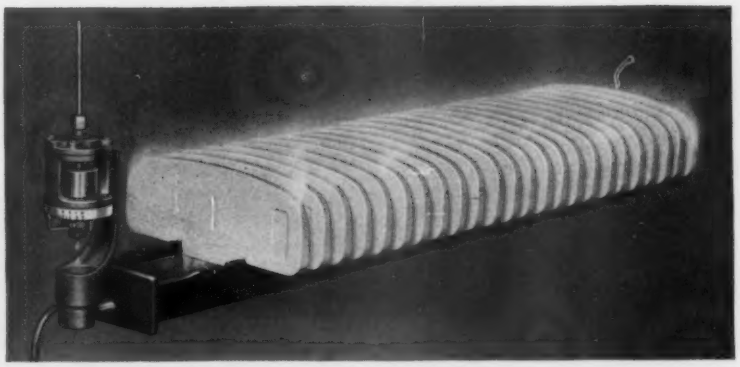
Burnham-Simplex Gas Boilers designed for hot water, steam or vapor heating systems are described in bulletin No. 767 of the Burnham Boiler Corporation of Irvington, N. Y. These boilers are equipped with accurate controls and thermostatic pilots. Steam units range from 2.1 to 37.6 B.H.P. with direct C.I. radiation rated from 300 to 6000 sq. feet. Units are also built for large volume hot water supply and for low pressure steam for industrial work. All units are constructed in accordance with the A.S.M.E. code and have the approval of the A.G.A. Testing Laboratory. Dimension diagrams are given and complete tables of ratings and other data for all sizes.

AUTOMATIC JUNE

HYDRO-METRIC HUMIDIFYING SYSTEM

GIVES ADDED SATISFACTION TO

GAS HEATING



SEND FOR FREE BOOK— "The Science of Re-Humidifying Indoor Air" liberally illustrated with authoritative charts which graphically explain everything heating men should know about humidification. Send for your copy.

Gas companies are finding in Automatic June the complete solution of the indoor humidity problem. Governed by outside temperatures, it eliminates excessive window condensation in cold weather—no more "weeping" windows. It affords ample humidification in mild weather or with forced air circulation. Automatic June is easily installed in any type of heating unit. No mechanism to become limed or get out of order. It can be relied on to give long, trouble-free service.

Send for descriptive literature.

MONMOUTH PRODUCTS CO., 217 E. 131st ST., CLEVELAND, OHIO

HEATING BUNKER "C" OIL

for carburetting gas requires high pressure and high temperature.

ANDALE BOWED TUBE HEATERS

remain tight and are easily cleaned. These are the requirements for continuous satisfactory operation.

ANDALE COMPANY

1600 ARCH STREET

PHILADELPHIA

MORE & MORE PIPE LINES Protected by DURNITE!

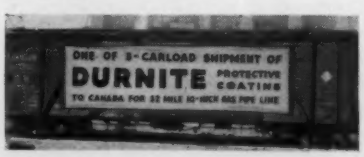
Sensational New One-Coat Protection Amazing New Economy Time-Labor Saving.

Durnite combines advantages that no other coating has—saves up to 80% time and labor. Strictly a one-coat process. No primer. Applied cold. Dries in 30 minutes. Applies in zero weather. Proof against soil stresses. Resistant to acids, alkalies, ammonia, salt water and gas fumes. Insoluble in gasoline and oil. Hydrogen-sulphide gas-proof to 200 degrees. Dielectric. Resists 6,000 volts. Heat to 400 degrees will not cause sagging. Corrosion resistant. Highly ductile.

Use Durnite for pipe lines, tanks, gas holders, and other surfaces subject to deterioration.

OUT GOES DURNITE CARLOAD AFTER CARLOAD

Carload after carload, Durnite goes to pipe lines. One natural gas company now coating fifth line (32 miles). Another coating 92-mile, 14-inch line.



ADVISORY SERVICE

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DURNITE COMPANY, 1210 David Stott Building, Detroit

Employer-Employee Relations

(Continued from page 10)

relationship program is proper accident prevention. It is one of the simplest things you can do and one of the least controversial bases upon which good employer-employee relations can be built. It is a type of activity which advertises itself, which makes itself felt and it should not be neglected. If you leave it to a safety engineer, that will never do. If you have forty supervisors in your organization you have forty "safety engineers", or you are not doing the job.

Training the Employee

Another important point in the industrial relations program is the matter of training, and your industry has done a great deal in that direction. I have seen some of the fine results that you have developed in the industry.

Training is becoming increasingly important now because, in spite of unemployment, there is developing a scarcity of skilled workers. Besides training your contact employees, which you have probably done better than anyone else, you have got to realize that the fellow who never gets out on the front line, has got to be trained also.

The point which I regard as of the utmost importance in the whole training program is an intelligent and comprehensive training of your supervisors because upon them depends the whole success of employer-employee relationships. It does not make any difference how fine the attitude of the president of the company may be toward the workers if his ideas are completely insulated by two or three strata of supervision which does not get the picture at all. Unless they are conductors of that idealism, that fair play which should emanate from the top of the organization, then they are defeating the purpose of the whole program.

Employee Contacts

You can set up a program doing a lot of things which may even do you harm, because the worker says, "That's a lot of baloney". You have got to get this thing across to the employee through his immediate supervisor. If you don't, he may give the lie to everything you do with good intentions. You have got to get this idea across to the supervisory organization. That is the big point I want to make in stressing the method by which this can be done.

I am not saying that in larger companies there is not a real need for personnel departments but they should function as service men for your supervisory organization to lift from them the detail of the many things that need to be done. But never permit in your organization the idea that, because you have a personnel department, that relieves of responsibility any minor executive or supervisor.

A mistake that has been made in industry generally is to under-estimate the workers' intelligence. You may think you can do a lot of things that the workers do not pay any attention to. I think in some quarters we have also been a bit insincere. Now that is not reflected in the majority of employers, but unfortunately a chiseling minority can make things look bad for decent employers. Let's not have our sins visited upon our brethren. If we have any wrinkles that need to be ironed out, let's do it ourselves.

The Planks of the Platform

With those oversights or mistakes in the background, I want now to mention the several planks in this platform.

First, let us solemnly resolve that we are going to sincerely provide a square deal for our workers. Let us be tolerant. Let us recognize that the worker we sometimes think of as a radical may be a very logical person, because his conclusions and his radical ideas can be no sounder than the facts upon which he bases his conclusions. We have got to recognize a certain degree of responsibility in that direction; we have got to have a certain tolerance that is not always in evidence.

The *second* plank is a resolution to maintain an open and flexible mind. Some startling things have happened in the last few years and we are going to have some startling things happen in the future. We must maintain an open and flexible mind towards these problems and not get jittery or stubborn. We must face these situations in an attitude of honest investigation.

The *third* plank: Let us resolve to build an intelligent leadership in our supervisory organization. Let us think over our organization and let us not retain in any position of responsibility any person who is not definitely an asset to the company in employer-employee relations. It is not enough today that supervisors merely be trouble-dodgers. They must be positive assets in the organization in building employer-employee relations—more so than ever before.

As the *fourth* plank, let us resolve that we are going to train and develop skill in our workmen and build them up to the fullest possibilities of their capacities, insofar as opportunities in our organization exist.

The *fifth* plank: Let us recognize the place of the human factor in our managerial responsibility. One of the most significant things Thomas A. Edison ever said, I think, was this: "We must in the future give the same attention to human engineering as we have given to technical engineering in the past." We have got to recognize that the human factor is becoming one which transcends others in importance.

The *sixth* plank: Let us resolve to get facts to our employees and not let them form their opinions on the basis of misinformation and half-facts. Let us recognize that we have a responsibility for getting facts to our employees which will enable them to have a sounder and healthier attitude towards our managerial problems.

The *seventh* plank: We should resolve to keep cool heads and maintain our perspective. If we rear up or bristle up everytime something runs counter to traditions, let us resolve to keep cool and not "tear our shirts". An executive puts himself at a great disadvantage when he gets excited and lets his emotions run away with him.

Let us not dodge imaginary troubles and create new problems for ourselves by failing to see employer-employee relationships in their proper perspective. That is the front upon which management must devote untiring and sincere work from today on.

Managing Committee Industrial Gas Section Meets

The Managing Committee of the Industrial Gas Section of the American Gas Association met at Headquarters December 8. Mr. Ralph Manier, well known industrial engineer with The Syracuse Lighting Co., Inc., Syracuse, N. Y., is chairman. Ways and means for promoting the wide use of gas in factories and commercial establishments were discussed and an aggressive plan developed. The use of gas in industry has been increasing steadily in recent years. This expansion has lately been accelerated to the point where more industrial gas is being sold today than during the previous peak year 1929. A still greater expansion is indicated.

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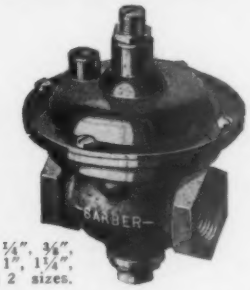

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Catalog and full information upon request.

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Thermostats • Safety Pilots • Relief Valves • Safetystats
3205 Perkins Avenue Cleveland, Ohio

TITAN WATER HEATER CONTROLS

(Continued from page 26)

A prominent builder of hot-blast stoves for blast furnaces reported at the meeting held at Bedford Springs that he has lined several hot-blast stoves with checkers having a wall thickness of 1¼" and 2½" flues. This has resulted in a much lower time interval for heating and a more uniform temperature of the air to the furnaces.

High-Temperature, Insulating Firebrick

It is the general practice to use high-temperature insulating block and fibrous insulation between the brick lining and the shells of water-gas machines. These materials disintegrate over a period of time and lose their insulating properties This is probably due to overheating at such time as when the liner blocks are worn thin and also to moisture.

Various manufacturers have developed insulating firebrick which is an entirely new type of material. They not only possess insulating properties better than the majority of high-temperature insulating blocks, but have refractory characteristics comparing favorably with any first-quality firebrick. Insulating firebrick is being used to replace block insulation in water-gas machines between the firebrick lining and the shell.

In many types of furnaces, these bricks are being used without veneer of firebrick on the side exposed to furnace gases and temperatures.

Hydraulic Insulating Materials

Precalcined, insulating, refractory materials mixed with a small percentage of lumnite cement are being used to insulate irregular surfaces where block insulation or insulating firebricks will not fit without cutting.

Manufacture

The method of manufacturing a brick fixes many of its physical properties.

For a complete description of the various processes, I refer you to Volume No. 1, Refractories, by F. H. Norton.

The latest development in the manufacture of dry pressed brick is described in a paper by W. F. Rochow, Technical Department, Harbison-Walker Refractories Co. The title of the paper is, "Refractories and Their Application." The fourth paragraph, page four, reads as follows: "A comparatively new development is the de-airing of brick by means of a high vacuum during forming, which adds much to the desirable physical properties of power-pressed brick for some applications. The de-aired brick are denser and less porous and, consequently, are more resistant to slag and gas penetration. They are also stronger and heavier and their heat capacities are greater. Selective grain sizing of the mix adds its share to the good properties of power-pressed brick."

Present Semet-Solvay Engineering Corporation Standards

The bricks used for water-gas machines are made from the highest quality, selected, flint fireclay and highly refractory bonding clays. All of the 9" straight brick and corresponding 9" sizes are made by the improved dry press and steam press method. All special shapes are hand made.

We specify "A" quality, No. 1 quality, and non-abrasive quality.

The approximate chemical composition of these types of brick is as follows:

	"A" Quality No. 1 Quality	*Non-Abrasive*
Silica	54.9%	56.4%
Alumina	40.6%	39.2%
Iron Oxide	2.0%	2.0%
Lime	0.3%	0.3%
Magnesia	0.4%	0.4%
Alkalies	1.8%	1.7%

The renewable liner blocks are made of specially burned "A" quality brick which give a hard skin surface having a low percentage of open pores.

The angle connection is lined with non-abrasive bricks which have this property because of the hard surface burn.

The No. 1 quality is used in the construction of the wall above the liner blocks and the domes and walls of the carburetor and superheater.

Whenever we have a problem in water gas that requires the best super-refractory for a generator lining, we use a solid lining of silicon-carbide.

We have long recognized the demand for an improved generator lining, say, half-way between firebrick and silicon-carbide. However, we have not yet found any. The selection of high-alumina refractories, which include diaspore refractories, seems the most promising. Further experimental work is necessary.

Recommended Tests

We invite your cooperation in conducting experiments with the object of improving refractories for water-gas machines.

Among other tests we suggest the following:

1. The use of insulating firebrick 9"x4½"x2½" in place of block insulation in all three shells.
2. Liner blocks in the 60% alumina class.
3. A firebrick with a higher silica content for lining the generator, carburetor, and superheater. We have observed that brick containing, say, 60% silica, which has a higher heat conductivity than the average first-quality firebrick, will absorb a greater amount of heat when properly insulated.
4. Line the angle connection with hydraulic firebrick backed up with insulating firebrick 9"x4½"x1¼".
5. Non-spalling thin-wall checkers having a rough surface and designed to provide uniform size of flues, and a free flow for the gases in all directions. This type of checker is being continually experimented with in the steel and other industries.

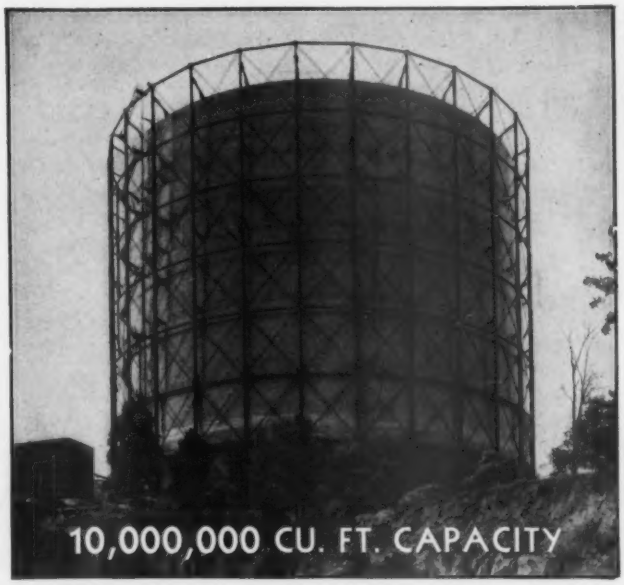
In presenting this paper, I have attempted to give you some of our experiences with the use of refractories considered for use in water-gas machines, which may or may not coincide with your experiences.

DISCUSSION

A. E. Walters,
Malden and Melrose Gas Light Company

Mr. Hughes' paper covers this subject in a most comprehensive manner giving the results obtained from many sources. It would seem that we should be able to profit from what he has told us. For comparison, I can give some of our experiences at Malden during the past two years.

Soon after beginning the use of heavy oil, we found among other difficulties that the refractories we were using were not suitable. We had been using a medium grade of fireclay lining with average success with light oil. When we attempted to use it for heavy oil, we found they spalled considerably and their life shortened by one-third, due, apparently, to the increased temperature and the more severe clinker formations. With this material, we could



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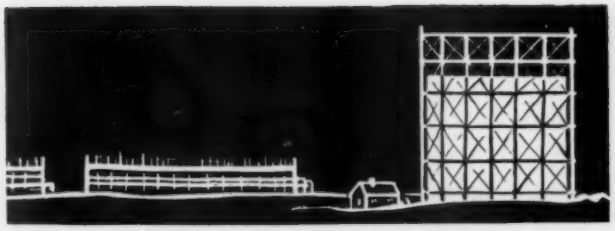

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obtain only about 2000 operating hours before the generator required new linings. During the period that this machine is shut down, we have to operate our other 11-ft. set with no reforming and about 16% increase in cost of manufacture. The reduction of the number of shut-down periods would, therefore, mean a reduction in the cost of water gas.

We experimented with a mullite lining and ran close to 6000 hours before any repairs were necessary. Our experience with this lining is at least encouraging and has demonstrated to us that it is more economical to use high-grade materials. It is our intention to continue these experiments.

At the present time, we are using a 50% alumina checker brick in the superheater of our back-run-reforming set. This brick is a dry pressed brick of greater density and should give us much better service.

There is considerable need for further research in the matter of water-gas refractories and we should be inspired by Mr. Hughes' paper to go at the work actively. There is little that I can add to what he has said but I have one thought which may be worth mentioning and that is the workmanship and method of installing refractories. The best of materials, if poorly installed, may give no better results than poorer materials properly installed.

Arthur S. Hall,
Springfield Gas Light Company

To the older gas men, the use of plastic materials is not new. They can remember when they patched holes in the old, stop-end retorts, large enough to crawl through, with a home-made material composed of broken fire brick and clay with some silicate of soda and borax mixed with it.

Our experience with plastic linings started in March, 1935. At that time, we built a new, top arch in an 8′ carburetor, lining the connections from generator to carburetor and from carburetor to superheater. After running 800 hours, this was examined It showed some expansion cracks, none of which extended through to the metal. These cracks were caulked with the same material and the carburetor is still in use and is satisfactory after running 1236 hours.

We decided to try a plastic lining for a 10′-6″ generator. This job was completed in August, 1936. At the end of 605 hours of continuous running, this machine was let down and we found that the clinker zone was badly worn, but the rest of the lining was in good condition. The clinker zone or 9-16″ courses of clay block was replaced and backed up with plastic. As this machine has just been started, we have no data on this construction.

The method of lining our 10′-6″ generator was as follows: 86—¾″ machine bolts were welded to the inside of the shell with the heads projecting toward the center of the machine. To these was attached a 3″ fire clay block containing a slot to fit the bolt head. This 3″ clay block had a recess in it to take another clay block 6″ long, making a fire clay keeper 9″ long and 2′ apart in courses around the entire shell. Then 1′ of loose asbestos was placed next to the shell, then a 3″ moulded magnesia block and 9″ of plastic material were also placed. After this, we washed the whole lining with a material called 'Disco Seal Alumina Oxide." I don't believe that this last coating was necessary, as it seemed to scale off as soon as it was heated. The cost of this job follows:

Material and labor, contract price	$800.00
Welding 86 bolts	20.17
Lumber for forms	6.75
Disco Seal Alumina Oxide	18.00
	$844.92

We have come to the conclusion that there is a definite place for the use of plastic material in the lining of pipes and connections and also for the linings of larger hot surfaces where it can be attached to the walls and does not have to support any great amount of weight.

For the lining of a water-gas machine generator, we recommend that some good, fire brick or carborundum lining be used in the clinker zone and, above that, plastic should be used for the side walls and top arch.

There are a number of different makes of plastic materials on the market. We have used only one and I think that the application of the material probably has a great deal to do with the success of the job.

R. L. Presbery,
Boston Consolidated Gas Company

We have had little experience with special refractories at Everett.

We have used various standard types and shapes of fire clay brick for linings, checkers, and two carborundum generator linings.

Our experience shows about the same average results as other plants.

Averages 1926 to 1931

Fire clay brick 5 ft. above grate. Generator linings in fire zone.

Average hours of service	2400
Maximum " " "	3300
Minimum " " "	1750

Carburetor checker

Average hours of service	2400
Maximum " " "	3300
Minimum " " "	1750

Superheater checker

Average hours of service	16,800
Maximum " " "	19,500
Minimum " " "	15,000

Carborundum Linings

In 1930, we installed 2 solid carborundum generator linings 4 ft. above the grates. Since then we have had irregular operation which has made conclusions difficult.

One lining of 2½ x 9 x 9″ blocks is in good condition and has had 2400 hours of service. We added carborundum arches to this lining last year to eliminate cast iron lintels. This arch has had 500 hours of service and is in good condition.

The other lining of 4 x 9 x 9″ blocks had 1500 hours of service but, because of its poor condition was removed this summer.

We have installed this year 4 carborundum linings of the first type 5 ft. above the grates with door arches.

INDEX TO ADVERTISERS

Alpha Lux Co., The 47
American Stove Company 27
Andale Company 51

Barber Gas Burner Co., The 53
Bartlett Hayward Co., The 6

Cast Iron Pipe Research Assn., The ..Inside Front
Chace Co., W. M. 49
Chaplin Fulton Mfg. Co., The 47
Connelly Iron Sponge & Governor Co. 57
Cruse-Kemper Co. 55

Dresser Mfg. Co., S. R. .....Back Cover
Durnite Co. 51

Gas Purifying Materials Co. 53

Hays Manufacturing Co. 50

Improved Equipment — Russell Engineering Corp. 57
Isbell Porter Co. 55

Johnson Gas Appliance Co. 49

Lambert Meter Co., Inc. 53
Lattner Mfg. Co., P. M. 48
Lavino & Co., E. J. 55

Mohawk Asphalt Heater Co. 55
Monmouth Products Co. 51

Pittsburgh Water Heater Co. 28

Reynolds Gas Regulator Co. 49
Robertshaw Thermostat Co. 45

Safety Gas Main Stopper Co. Inc. 55
Sement Solvay Engineering Corp. 3
Servel Electrolux Sales Div. ..... 4 & 5
Sprague Meter Co., The .....Front Cover
Superior Meter Company 47

Titan Valve & Mfg. Co., The 53

United Engineers & Constructors, Inc. 8

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IRON Connelly Iron Sponge and Governor Co. Elizabeth, N.J. Chicago **SPONGE**
1876 [USE THE BENEFIT of 60 YEARS EXPERIENCE] 1936

Pipe Corrosion and Coatings

(Continued from page 22)

of the average life of bare metal to be of value in economic studies. The most common practice is to assign life between limits for a given resistivity. No two territories may produce equivalent results, and therefore accelerated laboratory tests are not only desirable but essential in each survey, in order that the correlations between instrument readings and life of pipe may be accurately established.

However, the general experiences of others increase confidence in local findings. It is therefore desirable to insert a few findings, which are representative of many with which the numerical values found in a particular territory may be compared.

Allyne found in conditions in and around Los Angeles the following limits were generally applicable:

Rod Readings in Ohms per Cubic Centimeter	Probable Life of Bare Steel Pipe in Years
0 — 1000	0 — 9
1000 — 2500	9 — 15
2500 — 10000	15 or more

A different division of the resistance values is made by many corrosion engineers, in which they frequently substitute, for actual years, phrases which indicate the necessity for varying degrees of protection. For instance, values of resistance up to 500 ohms per cubic centimeter are considered as indicating soils as being highly corrosive. From 500 to 2500 ohms per cubic centimeter, the soil is considered to be merely corrosive, and above 2500 as mildly corrosive. The reason for these particular divisions is that values of resistance below 500 are considered as indicating soils which would require special protection in all instances. In the soils designated as corrosive, only a standard protection would be resorted to, and above 2500 or in the mildly corrosive sections, additional tests would be conducted to ascertain the actual corrosiveness of the soil before a final decision on protection was made.

Such broad designation as highly corrosive, corrosive and mildly corrosive, must be applied with judgment, and expert advice is desirable before definitely establishing such standards in a whole territory.

Along the Atlantic Coast much bog swamp exists. In one such area where bare 2" diameter steel pipe lasted from 9 to 18 months, electrical measurements produced resistances of 150 ohms per cubic centimeter at pipe level. The pipe lay in a continuously saturated bog just above a strata of sand, and the tides frequently raised the water level above the pipe. As the pipe advanced into higher and somewhat dryer soil, which was a mixture of bog and sand, the resistance increased to 500 ohms per cubic centimeter and the pipe life was from 4 to 5 years. Following was an area of sand and a mixture of sand and loam, varying in resistance from 700 to 1000 ohms per cubic centimeter, in which area the 2" diameter steel pipe had a life of from 10 to 15 years. In locations adjacent to this pipe but practically at the surface, where the ground was considerably dryer, soil resistance was practically infinite when measured during an extremely dry spell, and decreased to 4000 ohms per cubic centimeter at approximately pipe depth. These latter measurements were taken on private property adjoining the roadway on which the pipe had been installed, and are particularly significant in indicating the range of conditions from extreme to mild along the short distances traversed by services.

Weidner and Davis[6] contend that in soils having resistances below 1000 ohms per cubic centimeter, severe pitting usually occurs.

Turner[7] found on a 16" bare steel line that complete penetration of the wall occurred in 2 years in soils having a resistance of 200 ohms per cubic centimeter, and in 15 years when the value was 1200 ohms per cubic centimeter.

Cinder fills, which were surveyed by electrical methods, indicated resistance values from 1000 to 5000 ohms per cubic centimeter. Assigning a life to correspond to these resistance values is difficult, as highly localized conditions, particularly areas of high sulphur concentration, would cause rapid failure. Four inch bare steel pipe had lasted from 2 to 4 years in the cinder fill, although initial penetrations had occurred previous to the total life of 2 years.

Well drained soils with resistances above 10,000 ohms per cubic centimeter have been known, where complete replacement of ¾" bare steel pipe was necessary in from 6 to 15 years. These replacements occurred over a rather extensive area, in which the majority of soils were sands and sand loam mixtures.

[6] "Distribution Soil Surveys by the Shepard Rod Method", by A. B. Allyne, Chemist, Southern Counties Gas Co., Los Angeles, Calif. Presented in Western Gas 8-1931.
[6] American Petroleum Institute Production Bulletin 12-1931. C. R. Weidner and L. E. Davis, The Prairie Pipe Line Co.
[7] "Experiments with the Conductivity Method of Measuring Soil Corrosion" by Charles F. Turner presented at the A.G.A. Distribution Conference 4-1932.

Air Conditioning and Gas Househeating

(Continued from page 18)

35° and therefore the inside relative humidity correspondingly lower and even at times gets down to as low as 6%. Nature provides a secretion through the mucous membranes of the nose and throat that imparts a substantial moisture content to the air as it is taken into the lungs. But the continued demands from the excessively dry air of heated rooms eventually causes these secretions to dry up. Irritation and inflammation of these delicate membranes follow and one becomes easy prey to colds and infections.

Information given in the official reports of the U. S. Public Health service shows that the year's high point in sickness comes during the heating season. January, February and March far exceed other months in recorded sicknesses, especially colds, "flu", bronchitis, sinus, pneumonia and other respiratory ailments. Out of every three deaths, one is caused by diseases of the respiratory organs. Furthermore, statistics from life insurance sources prove that office workers have nine times as many colds as outside workers.

This article was not written with any thought of covering the subject of air conditioning technically. Some salient features have been pointed out and some experiences have been enumerated to assist those who may be planning such an activity.

The main thought has been to emphasize the advisability of entering the field which rightfully belongs to the gas industry rathen than allowing it to be grabbed up by those interested in competitive fuels.

This being the case, sound reasoning naturally places the responsibility in the hands of those best qualified to handle it—the househeating sales division of the gas new business department.

Helpful Data for use of the salesman and sales engineer on Air Conditioning and Househeating will be found in American Gas Catalog and Handbook 1936 Edition pages 163-180—Ed.]

JOURNAL

Gas Flow Computers
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Constants 1400-1000

High Pressure Computer Range:

Cu. Ft. of Gas Per Hour—100-10,000 M
Diameter of Pipe Inches ¾-30
Difference in Absolute Pressure—Lbs. per sq. in. 1-500
Sum of Absolute Pressures—Lbs. per sq. in. 2000-20
Specific Gravity 1.5-.35
Length of Pipe—Feet 100-5000
Length of Pipe—Miles 1-250

PRICE $3.50 Each

SIZE 6½″ x 8″

AMERICAN GAS JOURNAL

53 Park Place **New York**

SO SIMPLE —yet so Tight!

..joining pipe with Dresser Couplings!

Here's photographic proof of the extreme *simplicity* of installing a Dresser Coupling. This series of pictures shows clearly—step by step—that the Dresser joint is simply assembled—*not fabricated*—in the field. Only one tool is required—a wrench. RESULT: *A flexible joint, permanently tight!* Dresser Couplings are available for all kinds and sizes of plain-end pipe, from 3/8" to the largest diameter made. *Write for descriptive folder No. 355.*

S. R. DRESSER MANUFACTURING CO., BRADFORD, PA.
In Canada: Dresser Manufacturing Company, Limited
60 Front Street, West, Toronto, Ontario

DRESSER COUPLINGS

1.
Place one follower, then one gasket on each pipe end, about six inches from the end of the pipe.

2.
Shove middle ring over end of laid section of pipe until pipe stop or center bead on inside of middle ring comes up against the pipe end.

3.
Stab other pipe end into middle ring until it reaches pipe stop.

4.
Slide gaskets and followers up to and against middle ring, making sure gaskets are pushed under middle-ring flares uniformly at all points.

5.
Insert bolts, and run up nuts to finger tightness.

6.
Draw up nuts to final tightness with ratchet wrench, pulling up diametrically opposite bolts evenly and by progressive stages.

The microfilm contents of this roll were recorded as available.

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